ANALYSIS OF LARGE SYSTEMS SERVICE

1986

INPUT

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Customer Service Program

Analysis of Large Systems Service - 1986

ANALYSIS OF LARGE SYSTEMS SERVICE

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I INTRODUCTION

- This is the first in a series of reports covering the large systems market produced by INPUT for clients of the 1986 Customer Service Program. To minimize elapsed time between research completion and the delivery of the research findings, INPUT has adopted a new format for the 1986 program. Instead of separately bound, cumulative reports on an entire market segment (in this case the large systems market), INPUT will now deliver individual vendor's user analyses and vendor profiles as quickly as the research is completed. These modules will usually be released in groups of three to five analyses, shrink-wrapped and three-hole punched to facilitate placement in three-ring binders. Each service module (large systems, small systems, third-party maintenance, telecommunications, and software support) can be filed in clearly identified sections within each binder as received. As additional analyses are completed and delivered to clients, an updated table of contents will accompany the analyses.

- The first in the series of deliverables are the large systems user requirements/vendor performance analyses. In this section, which is to be filed in Section III of the large systems binder, user service requirements in the areas of hardware maintenance and systems software support are compared to actual vendor performance. Specific services analyzed include documentation, spare parts availability, engineer skill level, consulting, and training. Each analysis provides traditional measures of vendor performance, such as systems availability, response time, and repair time. Lastly, each analysis explores user attitudes toward alternative service delivery, whether that alternative is third-party maintenance, increased levels of service from the manufacturer in the form of premium services, or even increased levels of participation by the users themselves in the support of their own equipment.

- The large system module will cover both mainframe and superminicomputer systems. Representative systems include IBM 3080, National Advanced Systems 9xxx, CDC Cyber 170/xxx, and Amdahl 5800. The module also analyzes such superminicomputers as AT&T 3B, Data General MV10000, Gould 32, and Tandem Non-Stop.

- The next series of deliverables in the large systems module will be the company profiles of leading large systems vendors. The in-depth analyses of these service organizations will provide information on each vendor's hardware maintenance activities, software support services, educational service offerings, and professional service options. In addition, a description of each vendor's involvement in such critical areas as third-party maintenance and telecommunications support will be covered. As always, each profile will provide information on the service organization's structure, both internally and as a part of the company's corporate structure. Lastly, each profile will provide an analysis of the future direction expected for that company's service organization.

- Again, to reduce the elapsed time between completion of the research and the delivery of the research findings, these large system vendor profiles will be delivered in groups of three to five modules and will be filed in Section IV of the large systems binder. As with the user series, an updated table of contents will be provided as new segments are released.

- The last deliverable in the large system module will be the Service Market and Forecast, 1986-1991. This report, to be filed in Section V of the large systems binder, will provide both current and future market size forecasts for large systems maintenance and support. Separate components of this market, including hardware maintenance, software support, educational services, and professional services, will be explored. In addition, this report discusses the key service issues of the past year, with an emphasis on their future impact on service. Lastly, this report provides strategic recommendations based on the entire year's research activities.

- Along with the Service Market Analysis and Forecast, 1986-1991, each client will receive copies of the Executive Overview, which will provide a summary of the key findings of the year's research. These summaries are prepared in presentation format, facilitating slide preparation. As a result, these summaries are popular with many service executives as a source of presentation graphics with corresponding text provided. The Executive Overview should be filed in Section II of the large systems binder.

- The binder contains an Appendix section for information that may be sent at various times during the year. Summary exhibits, industry definitions, and questionnaires are examples of appendix information that would be filed in this section.

II EXECUTIVE SUMMARY

- This Executive Summary is designed to help the busy reader quickly review and summarize the research findings of the large systems module of INPUT's 1986 Customer Service Program. The summary is in presentation format, which facilitates the use of the summary as an in-house overhead presentation.

- The large systems service market has traditionally been the most significant, in terms of both size and services provided. Economic pressures, increased competition, and declining hardware service costs have slowed growth in this product segment. For these reasons, INPUT recommends the increased development of non-hardware maintenance activities, such as software support, to increase user satisfaction with service, decrease service price sensitivity, provide new revenue potential, and better differentiate service offerings from the competition.

A. THE 1986 CUSTOMER SERVICE MARKET

- As shown in Exhibit II-1, the peripheral market (made up predominantly of disk drives, tape drives, controllers, printers, and terminals) has caught up to the large systems market as the most significant service market in terms of user expenditures. Large systems market service revenue growth has been slowed by a number of factors:

  - Decreased capital spending by large corporate users.

  - Increased competition for the systems market by lower-priced alternatives.

  - Reduced services prices, reflecting increased system availability and service competition.

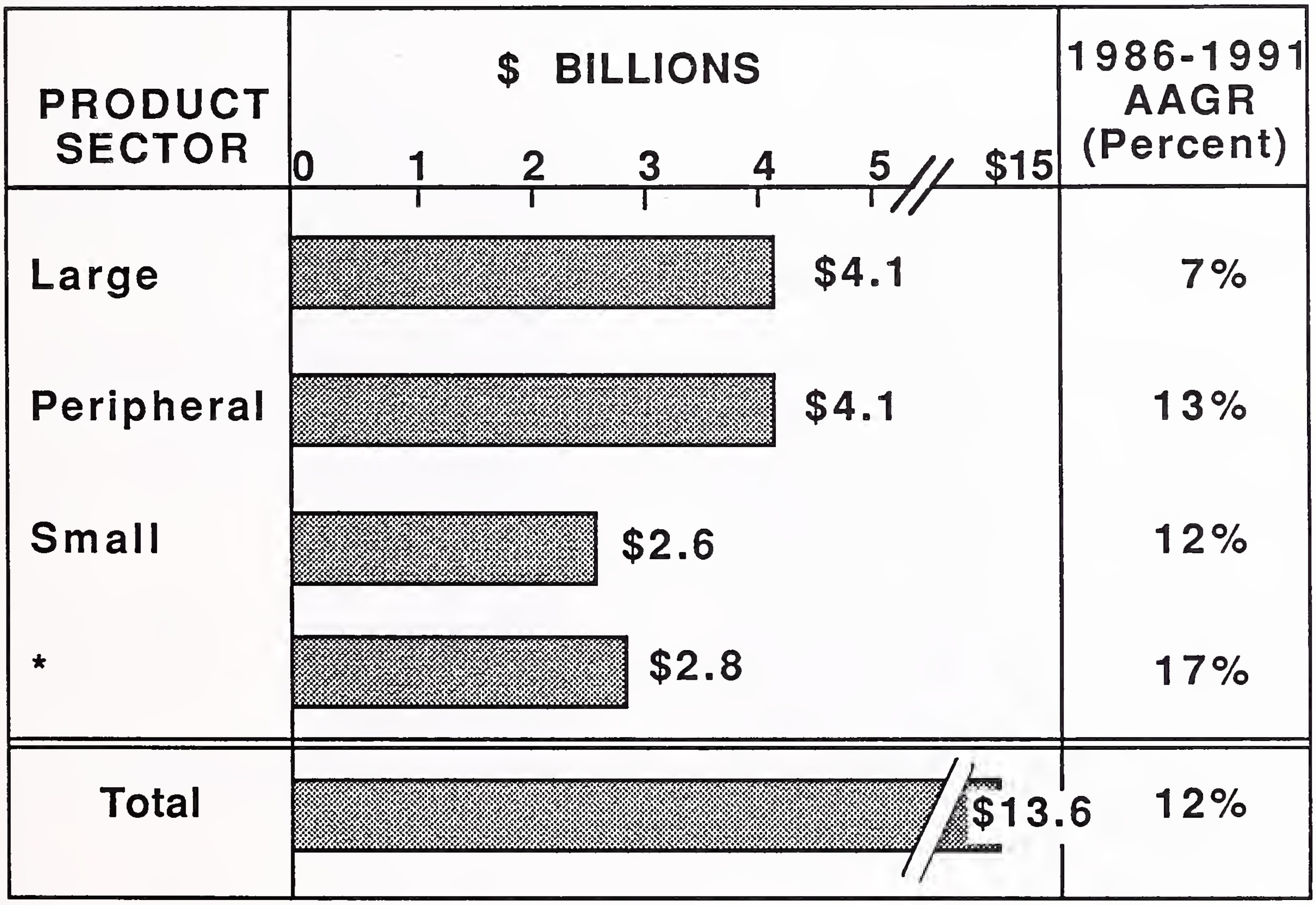
- Peripheral sales and service growth has been aided by user resistance to purchasing new large systems, preferring to expand their current systems with additional memory.

- Small systems growth is becoming increasingly segmented. Superminicomputer sales and service is growing rapidly as users are attracted to the improved price/performance ratings of these new machines (e.g., DEC VAX 8XXX). Traditional minicomputer growth is stagnant due to increasingly powerful supermicros.

- Telecommunications growth is fastest over the forecast period at 21% AAGR; however, the market is currently small and not well defined.

EXHIBIT II-1

1986 CUSTOMER SERVICE REVENUE BY SECTOR



* Comprised of Micro, Telecom, and Other

B. CHANGING MIX OF LARGE SYSTEMS SERVICE

- As computer equipment, particularly computer hardware, becomes increasingly reliable, the mix of customer services revenue will change to reflect this. This is especially true in the large systems market where improved manufacturing processes, multiprocessor design, and improved service delivery has increased large system availability above 98% for the industry in 1986.

- Users have perceived this increase in hardware reliability and, as a result, have pressured large system service vendors to reduce hardware maintenance prices to reflect the reduced costs of servicing these systems.

- The changing mix of large systems service (shown in Exhibit II-2) also reflects rising user requirements for non-hardware maintenance activities, particularly software support (growing at 24% AAGR during the forecast period) and professional services (23% AAGR).

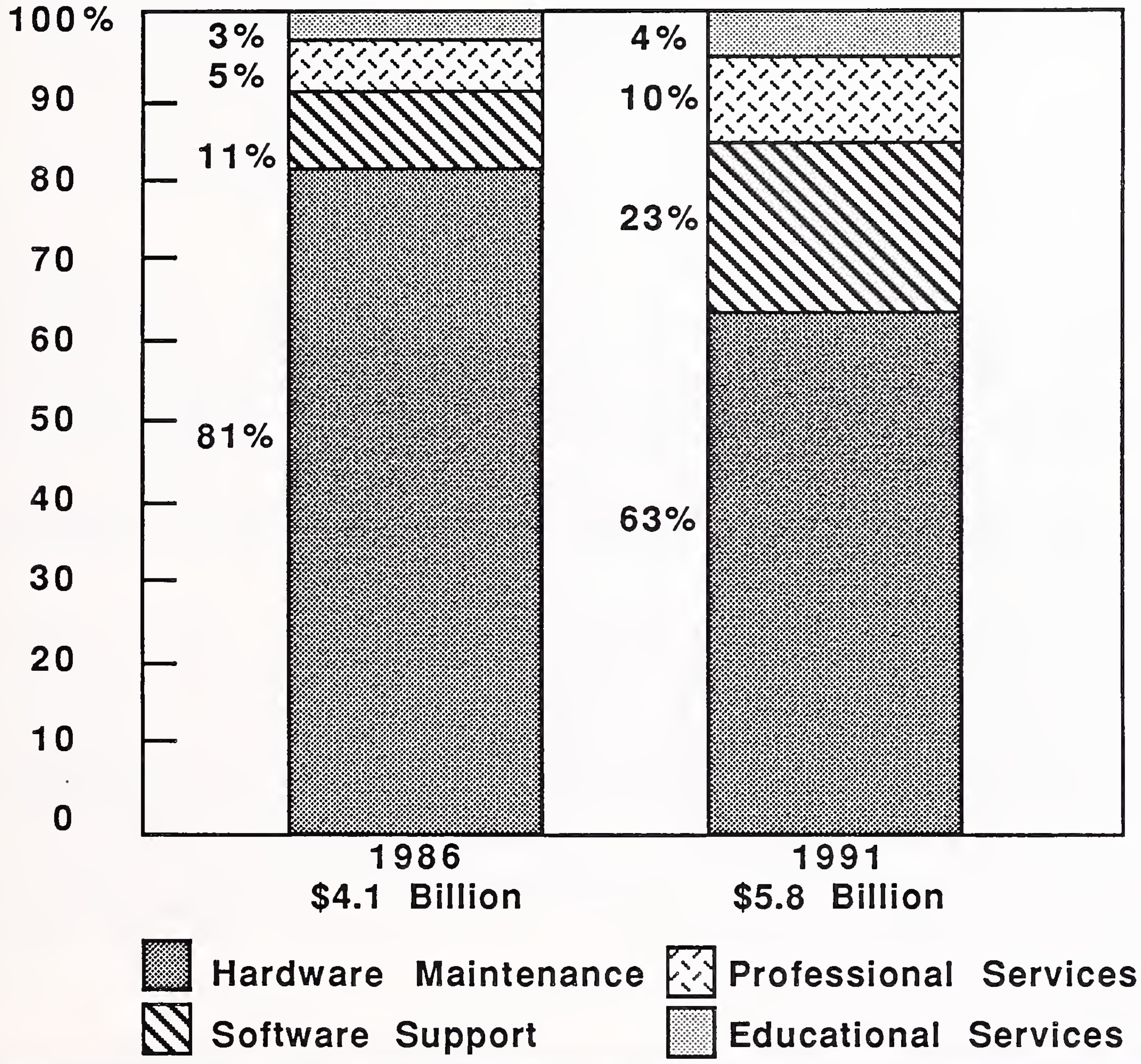
- Software support growth results from extremely high user requirements for increased and improved software support along with rapidly decreasing costs for providing this service. Users are extremely willing to pay more for software support (users find premiums of 13-17% to be acceptable) if they perceive improved service quality.

- Professional service growth should increase as users require more coordination in service in multi-vendor and multi-product installations, especially in the area of network planning and consulting.

EXHIBIT II-2

INPUT®

CHANGING MIX OF LARGE SYSTEMS SERVICE



C. LARGE SYSTEMS USER DISSATISFACTION WITH KEY SERVICES

- INPUT's 1986 large systems user service requirements research discovered that even though vendor service performance improved from 1985 to 1986 in system availability (98.3% compared to 97.5%), hardware problem resolution turnaround time (3.9 hours versus 4.0 hours), and software problem resolution turnaround time (20.3 hours versus 37.7 hours), only 44% of the large system user sample were satisfied with overall hardware maintenance and only 43% were satisfied with the overall software support that they received from their vendor.

- Key areas of user dissatisfaction are shown in Exhibit II-3. In the two highest priority services on the hardware side, spare parts availability and FE skill level, the large systems vendors managed to satisfy only 40% and 56% of the user sample respectively. And in the software side, only 44% and 38% of the sample were satisfied with their software engineer's (SE) skill level and their documentation.

- Since the supply of trained software engineers is expected to rise in the next five years, vendors should focus their attention on improving the quality of software documentation. Since 60% of all software problem calls are found to be the result of user misunderstanding or user misuse, vendors can expect to benefit by improving the clarity and "user friendliness" of documentation by the reduction of "no-fault found" calls.

- On the hardware side, increased user of remote support service will improve user satisfaction, both with the FE, who will benefit from improved diagnostics, and in the availability of spares, which will be better tracked by the system.

EXHIBIT II-3

LARGE SYSTEMS USER DISSATISFACTION WITH KEY SERVICES

SERVICE	PERCENT USERS SATISFIED	REQUIREMENT* 1 2 3 4 5 6 7 8 9 10
FE Skill Level	56%	9.0
SE Skill Level	44%	8.4
Spare Parts	40%	9.1
Software Documentation	38%	8.5

*Rating: 1 = Low, 10 = High

D. LARGE SYSTEMS SERVICE LEADERS

- In 1986, the large systems market was radically changed as the second and fourth largest companies, Burroughs and Sperry, merged to form Unisys and the third largest company, Honeywell, sold its computer systems activities to an international consortium comprised of Honeywell, Compagnie des Machines Bull of France, and NEC Corporation of Japan. When the dust settled, it became increasingly clear that the leading companies left in the large systems market were IBM, the newly formed Unisys, and the two plug-compatible manufacturers (PCM), Amdahl and National Advanced Systems, as shown in Exhibit II-4.

- Even though Unisys adopted the motto "the power of 2" to emphasize their strength resulting from the merger, it still remains to be seen whether Unisys can successfully combine the two incompatible (and formerly competitive) organizations, or whether they will follow the same path of two previous unsuccessful mergers, Sperry/RCA and Honeywell/GE.

- More likely, the true competition will be between industry leader IBM and the two PCMs, Amdahl and NAS. While Amdahl and NAS have been successful in gaining some ground with increasingly powerful alternatives to IBM's Sierra line, it is only a matter of time before IBM releases its next generation of large systems, code named Summit. Instead, the hottest competition will be between NAS and Amdahl.

EXHIBIT II-4

1985 LARGE SYSTEMS VENDOR SERVICE REVENUE

RANK	VENDOR	TOTAL SERVICE ($ Millions)	LARGE SYSTEM SERVICE ($ Millions)
1	IBM	$11,536	$2,884
2	UNISYS	2,142	635
3	AMDAHL	170	110
4	NAS	140	105

E. LARGE SYSTEMS DRIVE TO 100% SYSTEM AVAILABILITY

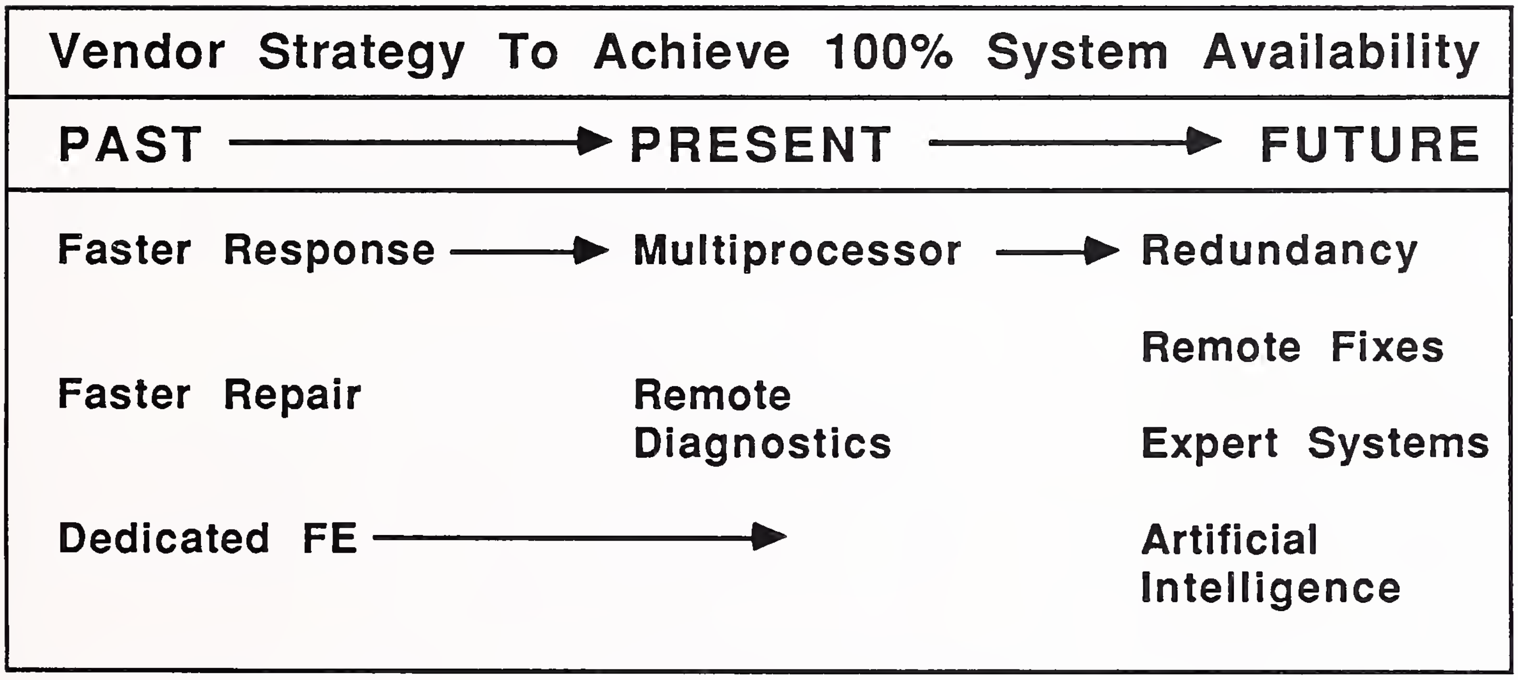
- Large system user requirements for system availability have risen from 96.7% in 1983 to 98% in 1986, and it is realistic to expect that user requirements will exceed 99% within the next five years. In the past, large systems manufacturers relied on improved manufacturing processes to increase system availability, as well as faster response and repair to minimize down time. Some vendors expanded on this effort with dedicated (on-site) engineers.

- Presently, service organizations have recognized that response and repair time effect on system availability has reached the limits of diminished returns, particularly in the large systems environment where response times average 1.2 hours and repair times average 2.7 hours. Instead, service vendors have benefited from new technology as current product design emphasizes multiprocessor systems for high system availability users. Also, most current systems offer remote diagnostics capabilities, reducing repair times.

- In the future, large systems vendors will need to increase their reliance on technological advances to improve system availability. Redundant systems will be the norm, and remote support capabilities will extend into actual fixes performed, either from a remote location or perhaps even by the system itself. Furthermore, the service organization will incorporate artificial intelligence (AI) and expert systems which will aid on-site service personnel (and remote support personnel) in diagnosis and problem resolution.

EXHIBIT II-5

LARGE SYSTEMS DRIVE TO 100% SYSTEM AVAILABILITY



Vendor Strategy To Achieve 100% System Availability

PAST →	PRESENT →	FUTURE
Faster Response →	Multiprocessor →	Redundancy
		Remote Fixes
Faster Repair	Remote Diagnostics	Expert Systems
Dedicated FE →		Artificial Intelligence

III A. INTERNATIONAL BUSINESS MACHINES (IBM)

- Fifty IBM mainframe users were interviewed in January and February 1986, comprising 25 4300 and 25 308X users. The demographic sample was evenly distributed geographically and by industry served. All interviews were conducted by telephone, typically with the data processing manager (50% of all interviews) or operations manager (38%) at each site. The average interview lasted 15-20 minutes.

- Overall, IBM hardware service ratings did not change dramatically between 1985 and 1986, as demonstrated in Exhibit III-A-1. Most users indicated that they were receiving about the same level of service in 1986 as in 1985 with the notable exception of training. However, user expectations for hardware services continue to escalate, resulting in unmet service requirements (Exhibit III-A-2) and lower levels of customer satisfaction (Exhibit III-A-3).

- Parts availability and engineer skill level continue to be major problem areas as users become more and more dependent on their equipment. Improved engineer training was the most frequently cited service area needing improvement. User satisfaction with training fell from 69% in 1985 to 44% in 1986 as a result of increasing cost and lack of availability for many users who cannot afford to send their employees off-site.

- Exhibit III-A-4 graphically illustrates the growing dichotomy of IBM hardware services. Low requirement services, such as remote support, typically meet user needs, but high requirement services definitely fall in the dissatisfied category. In the past, IBM has been successful in the integration of high and low requirement services into a reasonable "middle ground." In the 1986 survey, however, extremes in customer service requirements have become evident.

EXHIBIT III-A-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
IBM

HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE		USER RATING*	
	Decline -1.5 -1.0 -0.5	Improve 0.5 1.0 1.5	1985	1986†
Service Overall		0.0	8.4	8.4
Documentation	-0.1		7.7	7.6
Training	-1.1		7.4	6.3
Consulting	-0.2		7.3	7.1
Engineer Skill Level		0.1	8.4	8.5
Parts Availability	-0.2		8.2	8.0

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.3

EXHIBIT III-A-2

1986 USER HARDWARE SERVICE RATINGS
IBM

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	7.6	7.6	-
Training	6.7	6.3	(0.4)
Consulting	7.0	7.1	0.1
Remote Support	6.1	6.3	0.2
Engineer Skill Level	9.1	8.5	(0.6)
Parts Availability	9.3	8.0	(1.3)
Hardware Service Overall	9.2	8.4	(0.8)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.3

EXHIBIT III-A-3

USER SATISFACTION: HARDWARE SERVICE
IBM

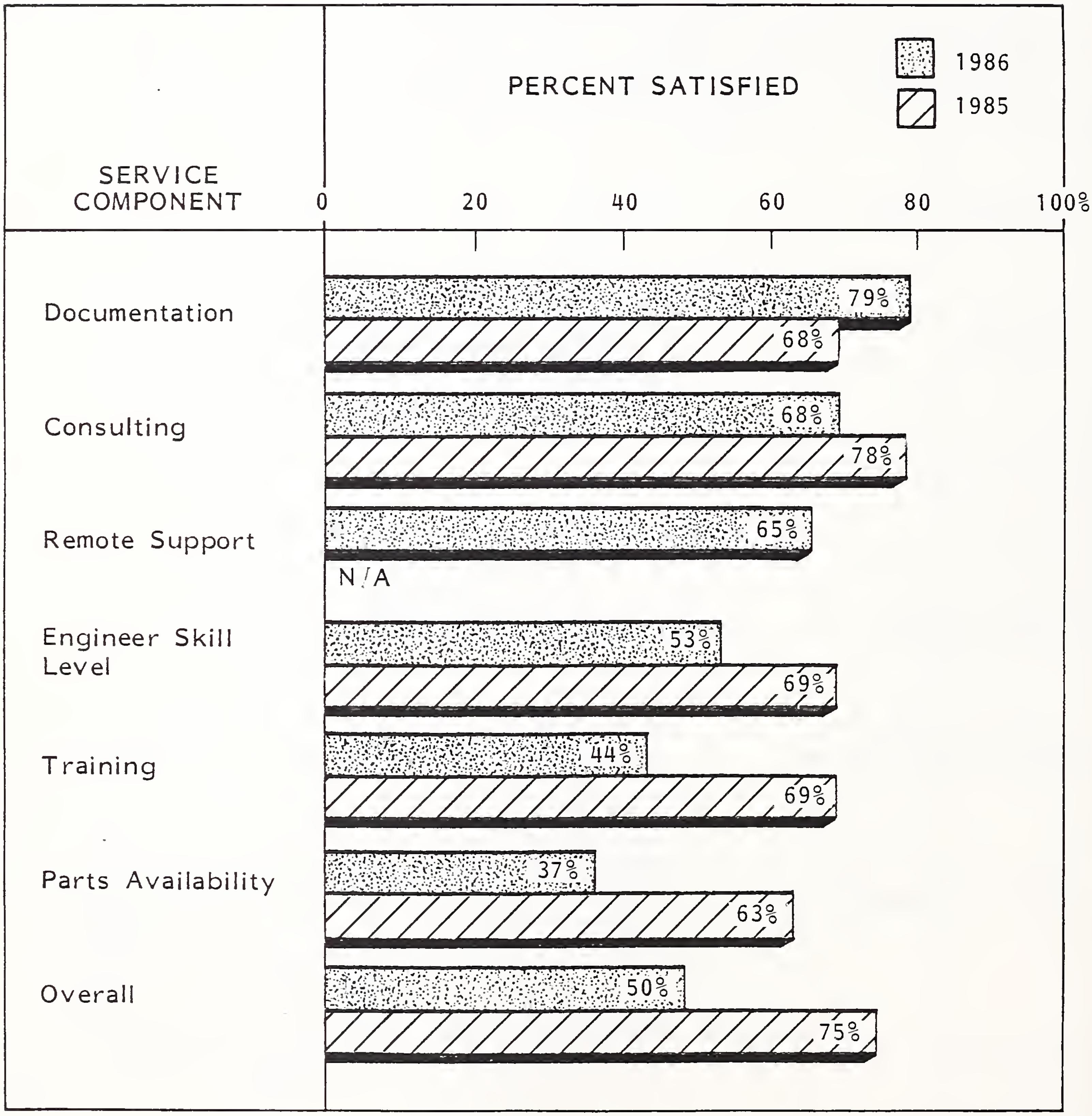
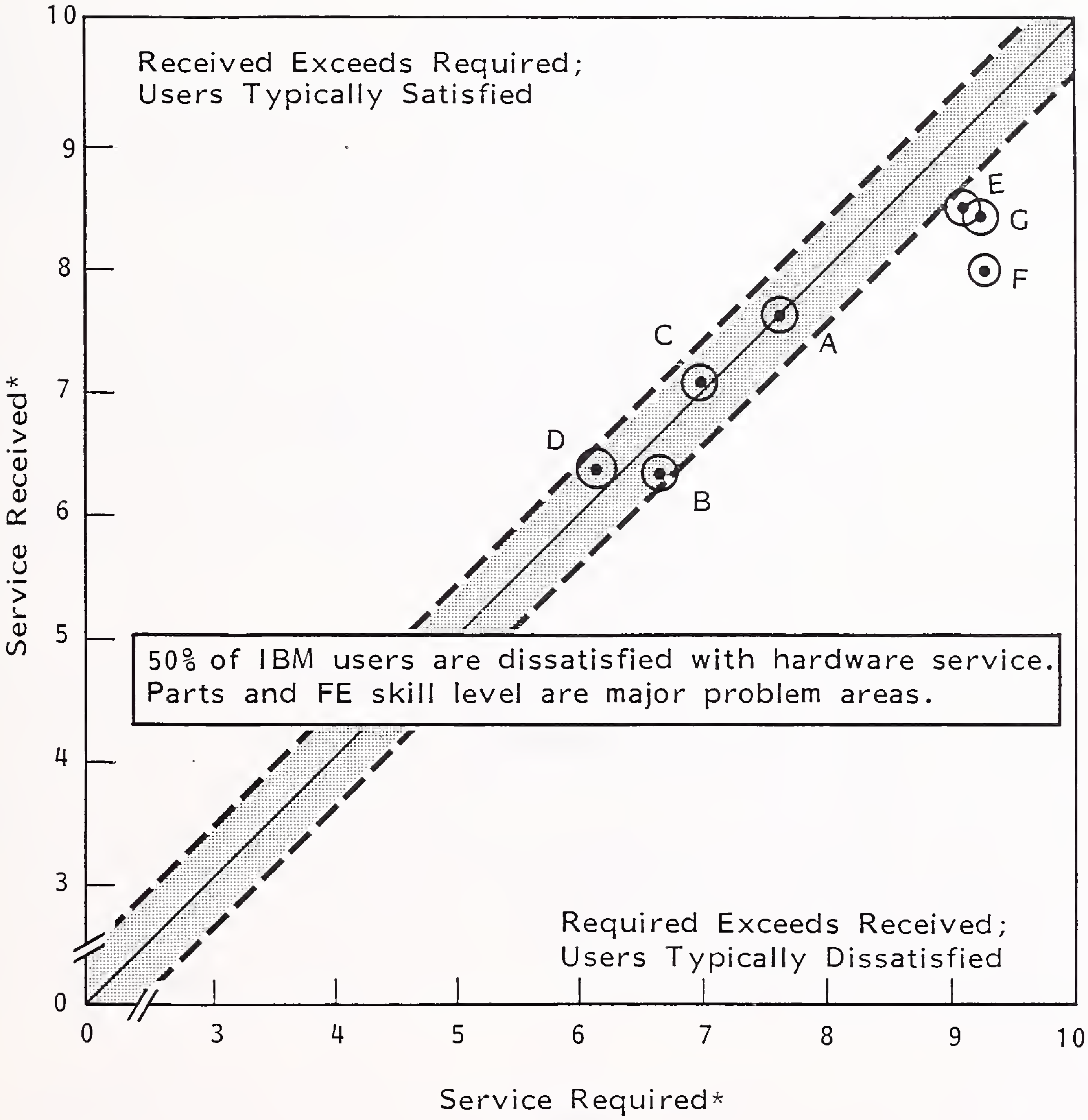


EXHIBIT III-A-4

HARDWARE SERVICES REQUIRED/RECEIVED
IBM



50% of IBM users are dissatisfied with hardware service. Parts and FE skill level are major problem areas.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

- Systems software support performance is analyzed in Exhibits III-A-5 through III-A-8. As with hardware service, IBM systems software performance did not change dramatically between 1985 and 1986. User expectations for systems software service did increase, however, and as a result, satisfaction rates are quite low. As Exhibit III-A-7 demonstrates, a majority of IBM mainframe users are dissatisfied with four out of the top six software service categories.

- Improved systems software support is a major concern of most IBM large system users. The user requirement for overall systems software support increased from 7.2 (1 = low, 10 = high) in 1984 to 7.6 in 1985 to 8.7 in 1986. INPUT expects demand for support in this area to continue to grow as users become more dependent on systems software availability.

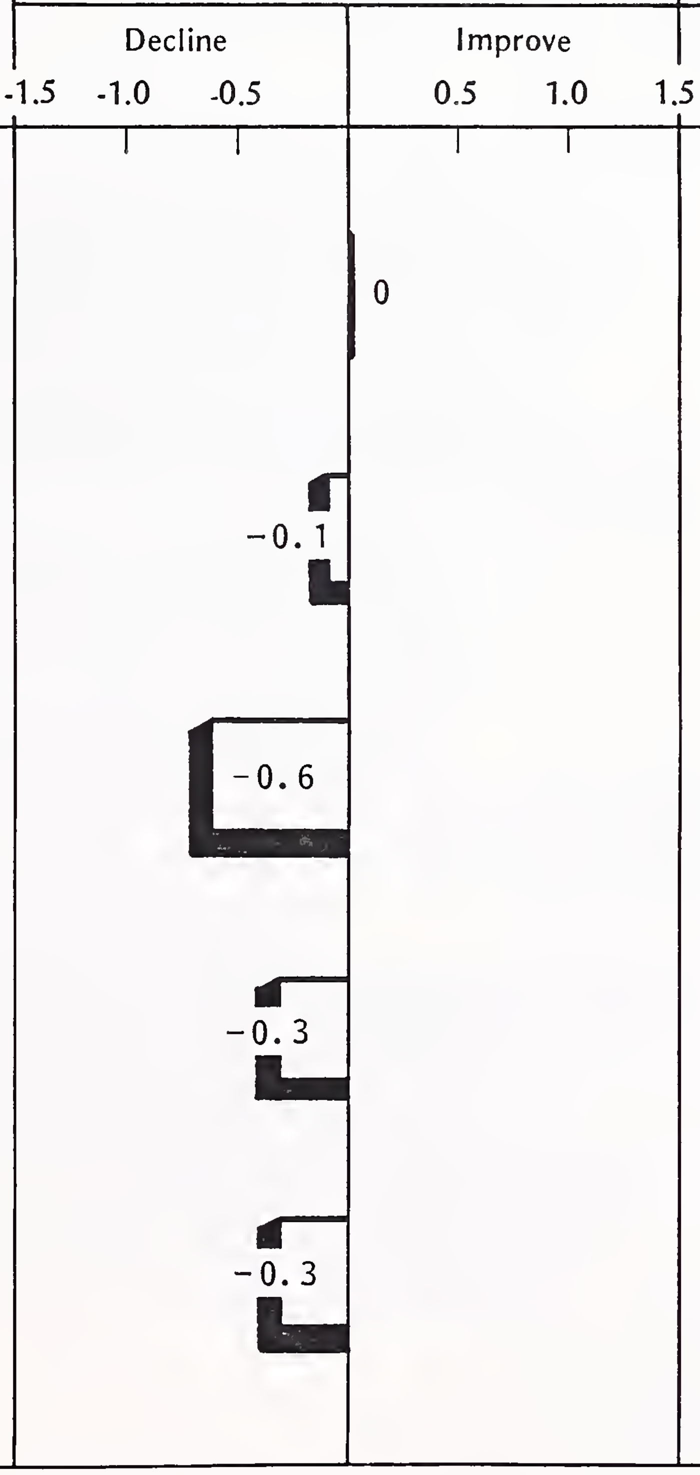
- Overall satisfaction with systems software support is influenced primarily by three services: the perceived skill level of the engineer, the quality of the documentation, and the availability of training. As Exhibit III-A-8 shows, user requirements in these three critical areas are not being met. As a result, current user satisfaction with overall systems software support from IBM is significantly below 1985 levels.

- IBM's performance, as measured by the criteria in Exhibit III-A-9, has actually improved. Despite lower satisfaction rates, customers report fewer system interruptions, faster hardware response/repair times, and faster systems software repair time. It is particularly frustrating to vendors when, as in the case of IBM, the number of interruptions falls by over 60% and yet satisfaction continues to decline. Exhibit III-A-10 demonstrates that IBM actually exceeded user expectations for hardware repair time and systems software response time.

- INPUT believes that customer satisfaction with hardware and systems software service has not been impacted by actual declines in service (Exhibits III-A-9 and III-A-10 demonstrate that this is not the case). Rather, because their expectations for services have increased dramatically, users perceive a

EXHIBIT III-A-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
IBM



SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING* 1985	USER RATING* 1986†
Service Overall	0	7.3	7.3
Documentation	-0.1	7.6	7.5
Training	-0.6	7.5	6.9
Consulting	-0.3	7.3	7.0
Engineer Skill Level	-0.3	7.6	7.3

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.3

EXHIBIT III-A-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS

IBM

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	8.9	7.5	(1.4)
Training	7.8	6.9	(0.9)
Consulting	6.8	7.0	0.2
Remote Support	6.7	7.0	0.3
Engineer Skill Level	8.5	7.3	(1.2)
Service Overall	8.7	7.3	(1.4)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.3

EXHIBIT III-A-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
IBM

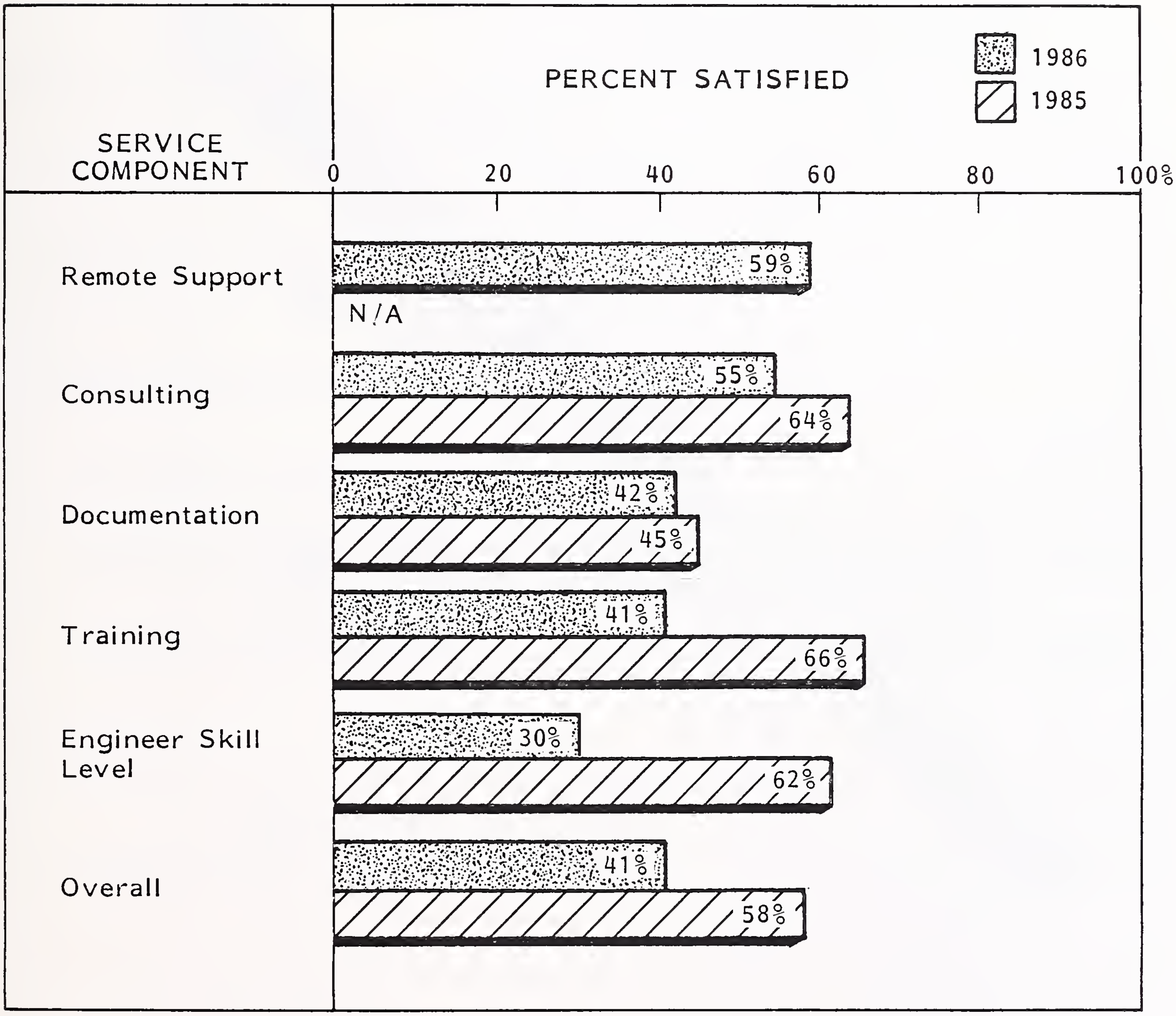
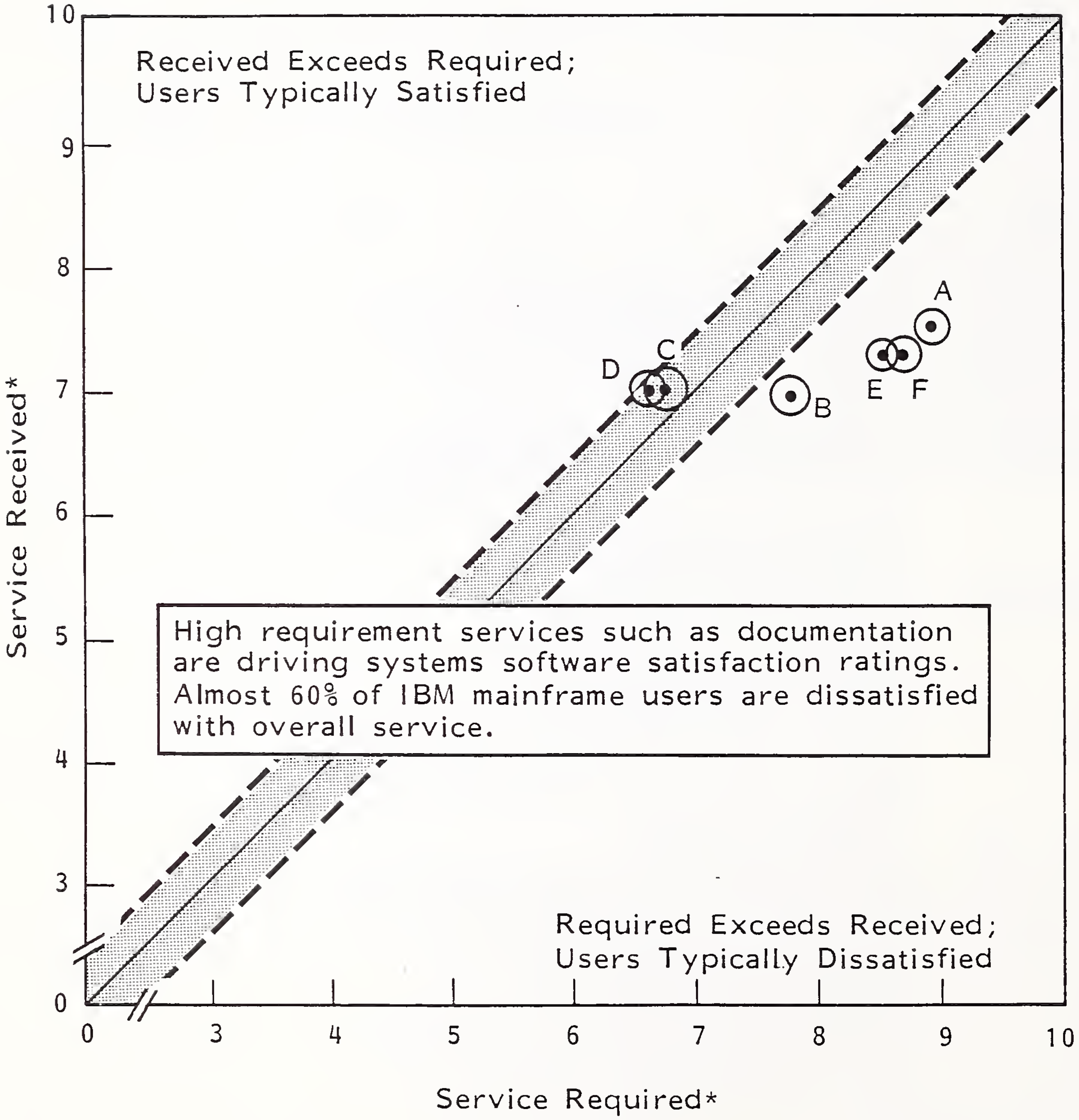


EXHIBIT III-A-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
IBM



High requirement services such as documentation are driving systems software satisfaction ratings. Almost 60% of IBM mainframe users are dissatisfied with overall service.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-A-9

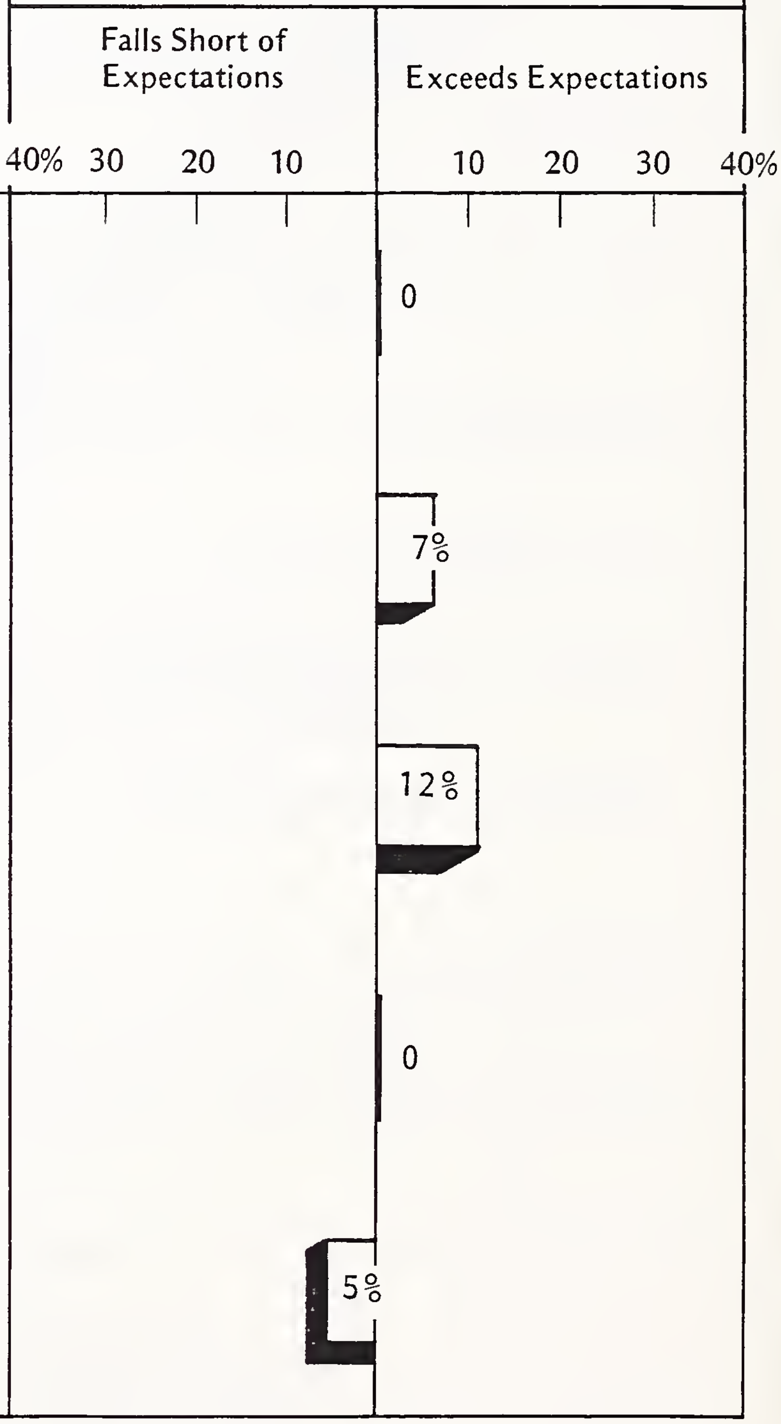
SERVICE PERFORMANCE
IBM

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	98.2%	97.8%
Average Number of Interruptions		
Per Month (Number)	2.8	1.0
Percent Hardware Caused	53.0%	56.9%
Percent Software Caused	42.0%	37.3%
Average Hardware Response Time (Hours)	1.5 hr.	1.3 hr.
Average Hardware Repair Time (Hours)	3.4 hr.	3.0 hr.
Average Systems Software Response Time (Hours)	4.0 hr.	5.3 hr.
Average Systems Software Repair Time (Hours)	18.8 hr.	11.1 hr.

EXHIBIT III-A-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE
IBM

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent)	
		Falls Short of Expectations	Exceeds Expectations
System Availability (Percent)	97.7%		0
Hardware Response Time (Hours)	1.4 hr.		7%
Hardware Repair Time (Hours)	3.4 hr.		12%
Systems Software Response Time (Hours)	5.3 hr.		0
Systems Software Repair Time (Hours)	10.6 hr.	5%	



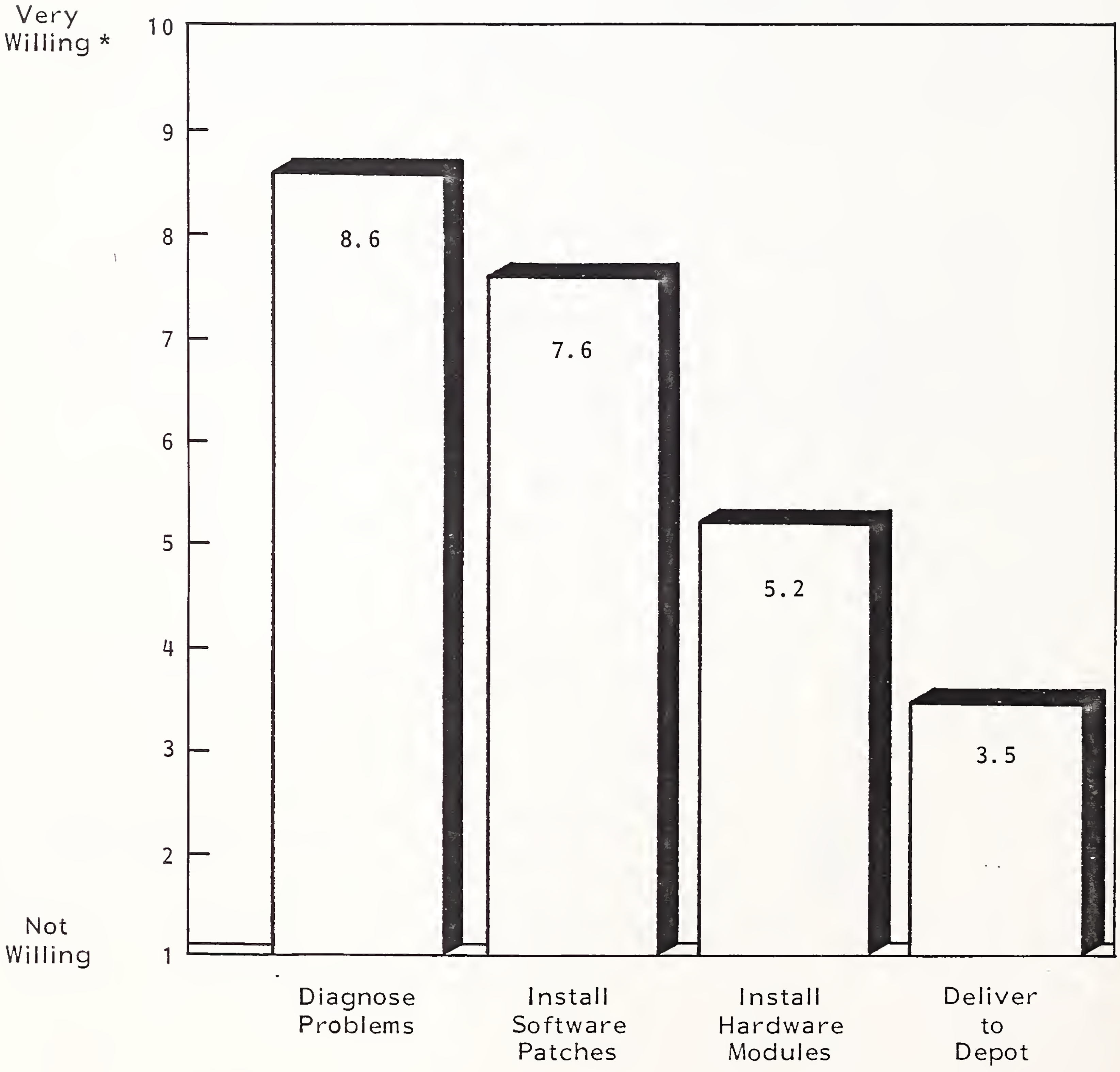
lack of commitment on the part of the manufacturer. Dissatisfaction with engineer skill level, for example, has been impacted by the increasing modularity of parts; engineers may have the skill to repair parts on-site, but corporate policy forbids this. IBM must address this perception of decline in service which is actually a change in manufacturer policy.

- Non-manufacturer supplied service is addressed in Exhibits III-A-11 and III-A-12. Most users are willing to become involved in selected aspects of service, particularly diagnostics. Many IBM users currently have systems software programmers and consequently are more willing to install software patches. Users are much more reserved about becoming involved in hardware service, and there is little or no interest in delivering equipment, such as terminals, to a depot for repair.

- Over 80% of the IBM users interviewed said that they required at least some extended services. Exhibit III-A-13 demonstrates that the most popular extended service is PM during non-prime hours. The percent of users requiring extended services, however, has been declining as more services are being unbundled, causing users to reevaluate service needs and choose those services which are currently necessary.

EXHIBIT III-A-11

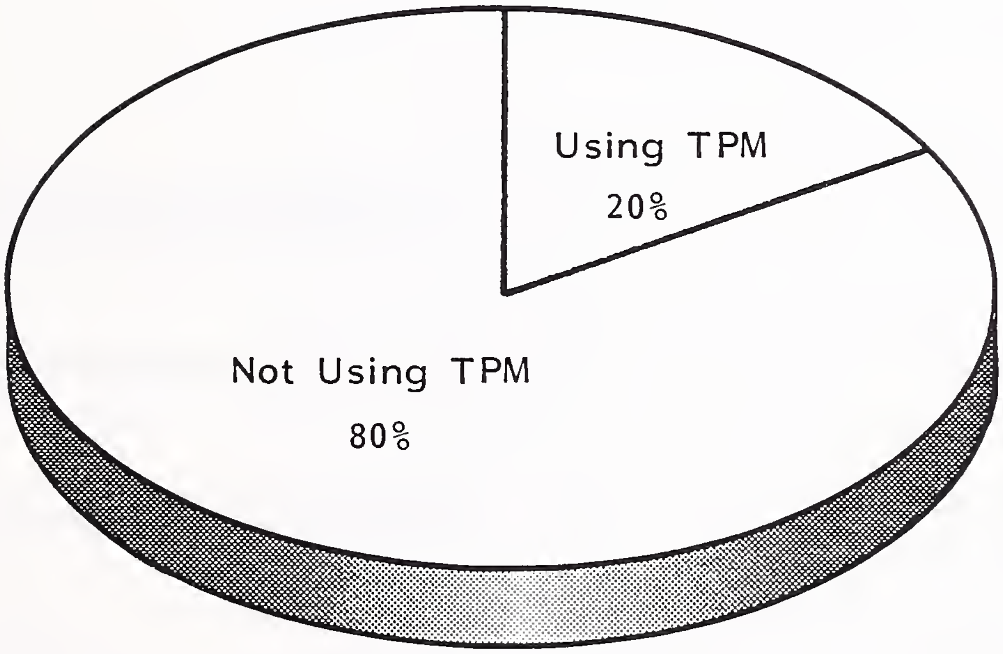
USER WILLINGNESS TO PERFORM MAINTENANCE
IBM



* Average Standard Error: 0.4

EXHIBIT III-A-12

CURRENT TPM USE
IBM

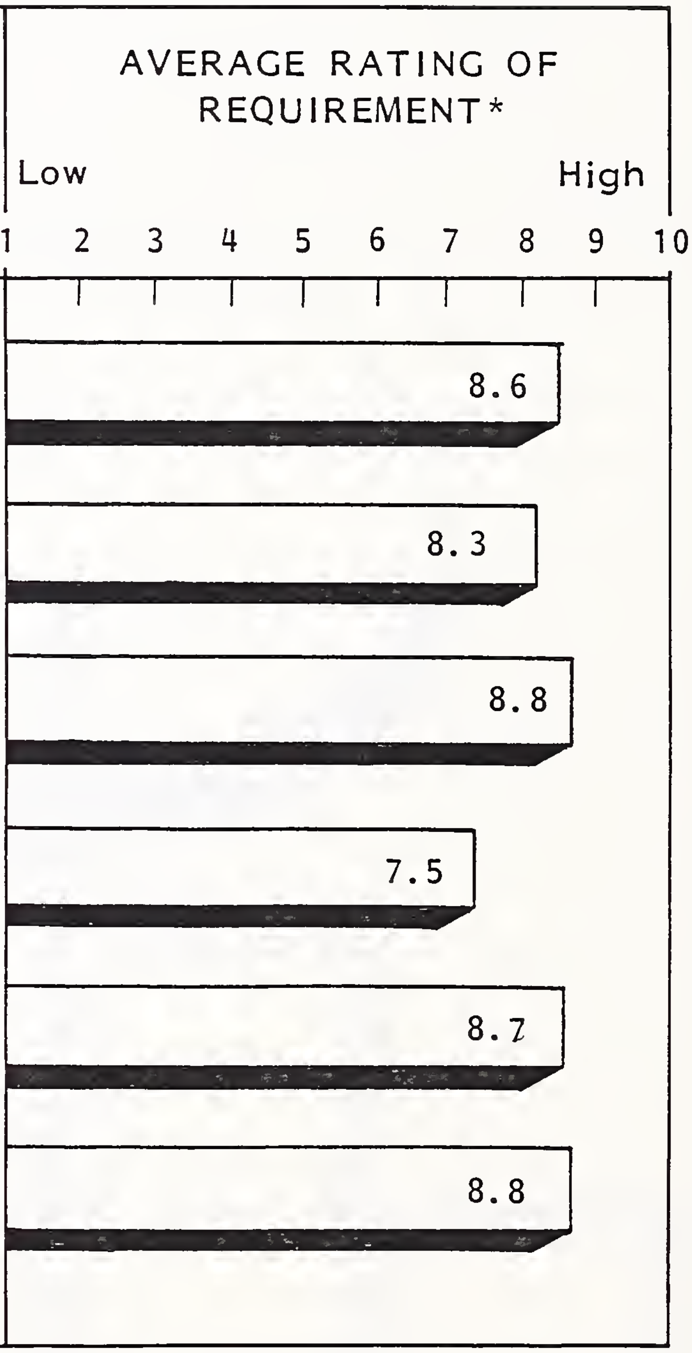


20% of IBM Large System users have TPM contracts on at least one piece of DP equipment, down from 1985 (23%).

EXHIBIT III-A-13

USER REQUIREMENTS FOR EXTENDED SERVICES
IBM

SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT*
Standby Coverage	40%	8.6
Remote Diagnostics	46	8.3
Preventive Maintenance during Non-Prime Hours	54	8.8
Deferred Response	8	7.5
Under Two-Hour Response	38	8.7
Maintenance Management	26	8.8



*Average Standard Error:

B. AMDAHL

- Twenty-five Amdahl 58XX users were interviewed by telephone for this report. The interviews were conducted in February 1986 and in most cases (over 70%) the respondent was the manager of data processing. Other respondents included operations managers and MIS directors. The survey was evenly dispersed geographically and the industries represented included manufacturing (16%), services (23%), government (25%), banking (4%), and transportation, utilities, retail, and insurance (8% each).

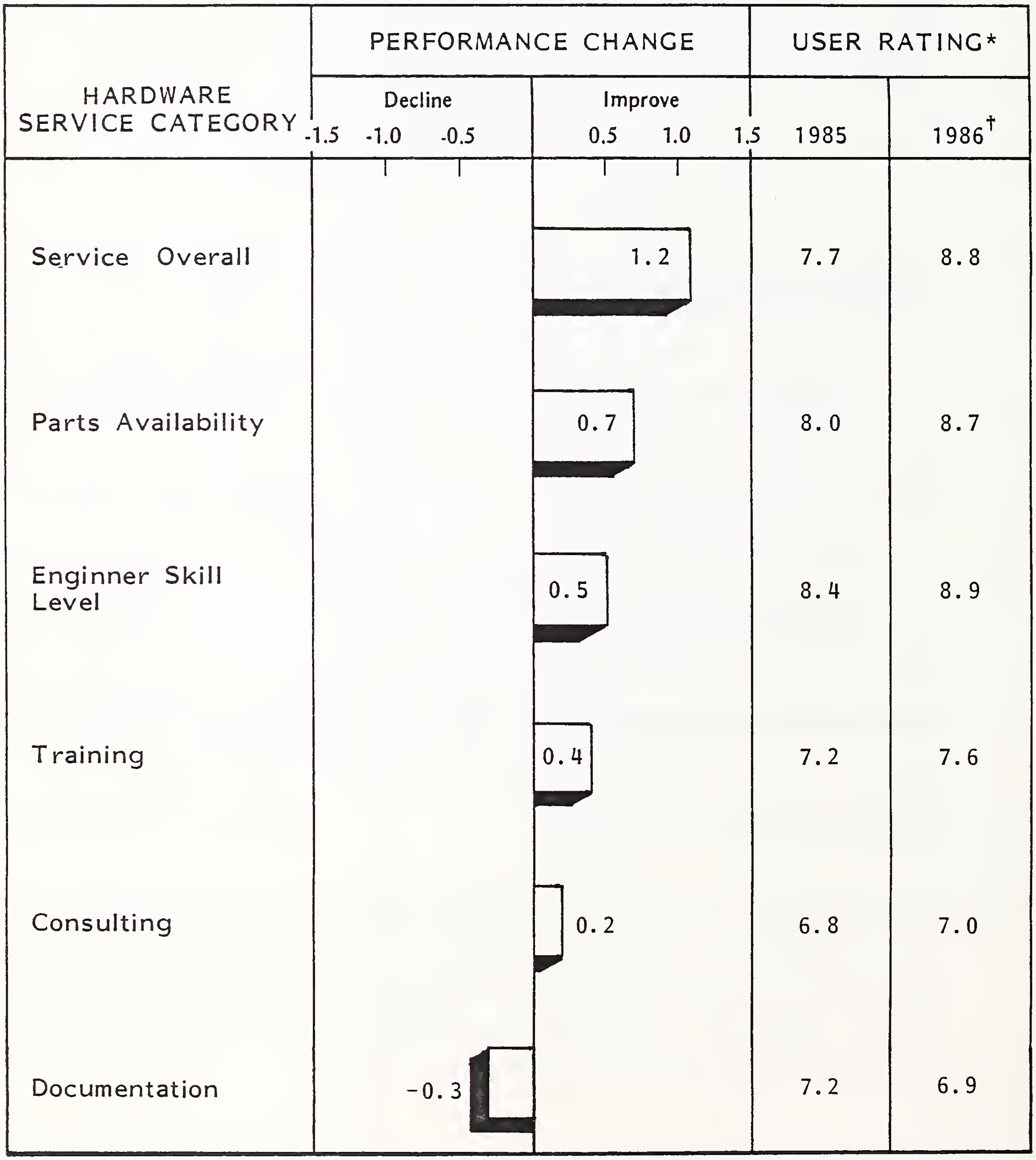
- Overall, customer ratings of Amdahl service increased substantially from 1985 to 1986, as demonstrated in Exhibit III-B-1. The increase in bottom line ratings was primarily the result of gains made in parts availability and higher levels of engineer training and skill. Although Amdahl's performance in these key support areas still does not measure up to their users' expectations (see Exhibit III-B-2), substantial progress has been made, according to the user base.

- As a result of the improvements made in hardware service, it is not surprising that Amdahl user satisfaction has increased in 1986. Exhibit III-B-3 demonstrates that satisfaction levels have improved in five key areas between 1985 and 1986--documentation, training, engineer skill level, parts availability, and hardware service overall. More Amdahl users are satisfied with overall hardware support (66%) than either of the company's major competitors (IBM - 50%, NAS - 61%).

- Graphically presented (see Exhibit III-B-4), the reader can see the segmentation taking place in the users' evaluation of service. Amdahl tends to meet user needs for relatively low requirement services, such as documentation and training. High-level requirements in areas such as parts availability and field engineer skill level, however, are not being met.

EXHIBIT III-B-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
AMDAHL



HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING*	
	Decline -1.5 -1.0 -0.5 / Improve 0.5 1.0 1.5	1985	1986†
Service Overall	1.2	7.7	8.8
Parts Availability	0.7	8.0	8.7
Enginner Skill Level	0.5	8.4	8.9
Training	0.4	7.2	7.6
Consulting	0.2	6.8	7.0
Documentation	-0.3	7.2	6.9

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-B-2

1986 USER HARDWARE SERVICE RATINGS
AMDAHL

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Engineer Skill Level	▨ 9.3	▨ 8.9	▨ (0.4)
Hardware Service Overall	▨ 9.2	▨ 8.8	▨ (0.4)
Parts Availability	▨ 9.2	▨ 8.7	▨ (0.5)
Training	7.6	7.6	-
Remote Support	7.3	8.5	1.2
Consulting	7.0	7.0	-
Documentation	6.6	6.9	0.3

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-B-3

USER SATISFACTION: HARDWARE SERVICE
AMDAHL

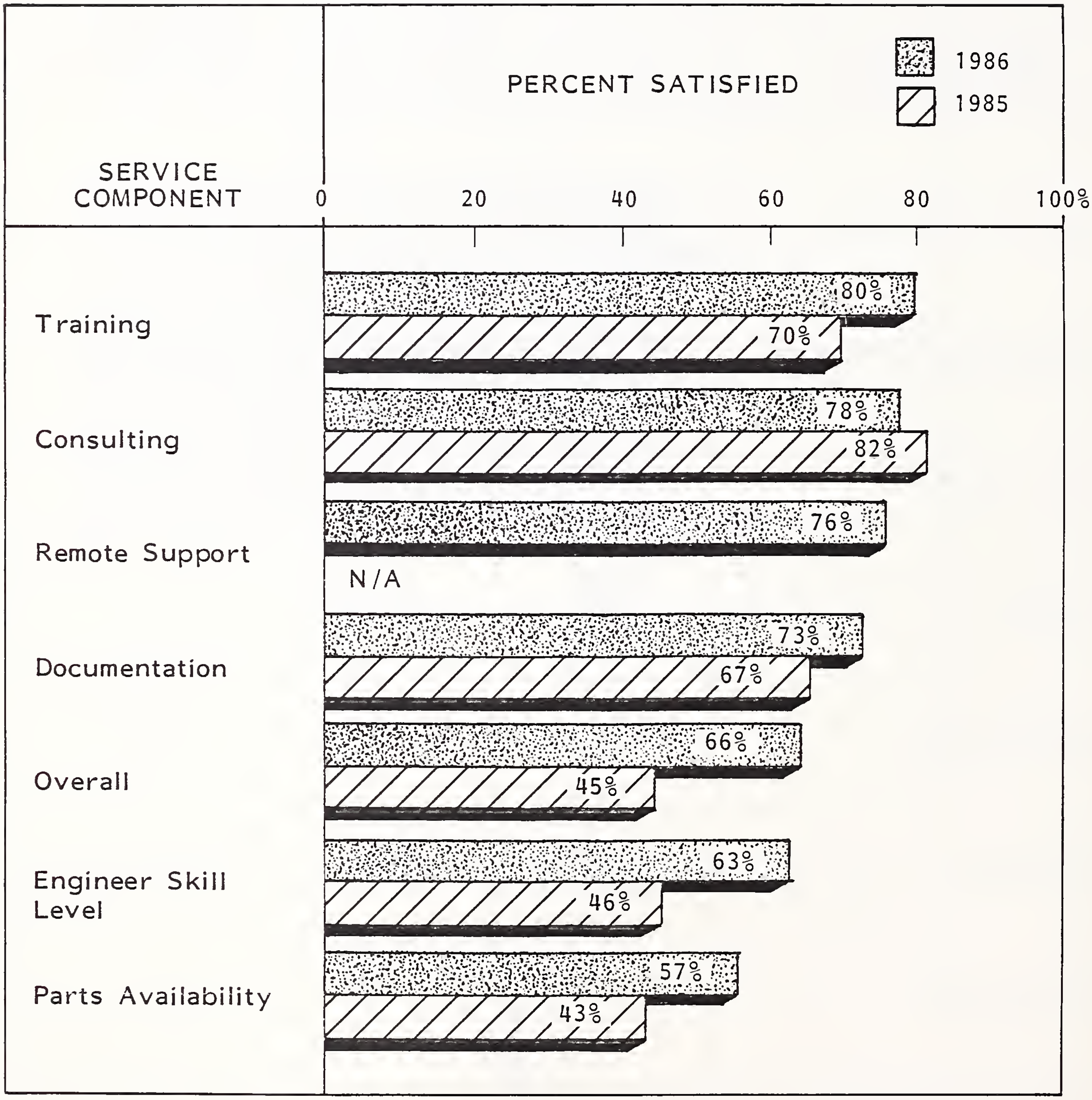
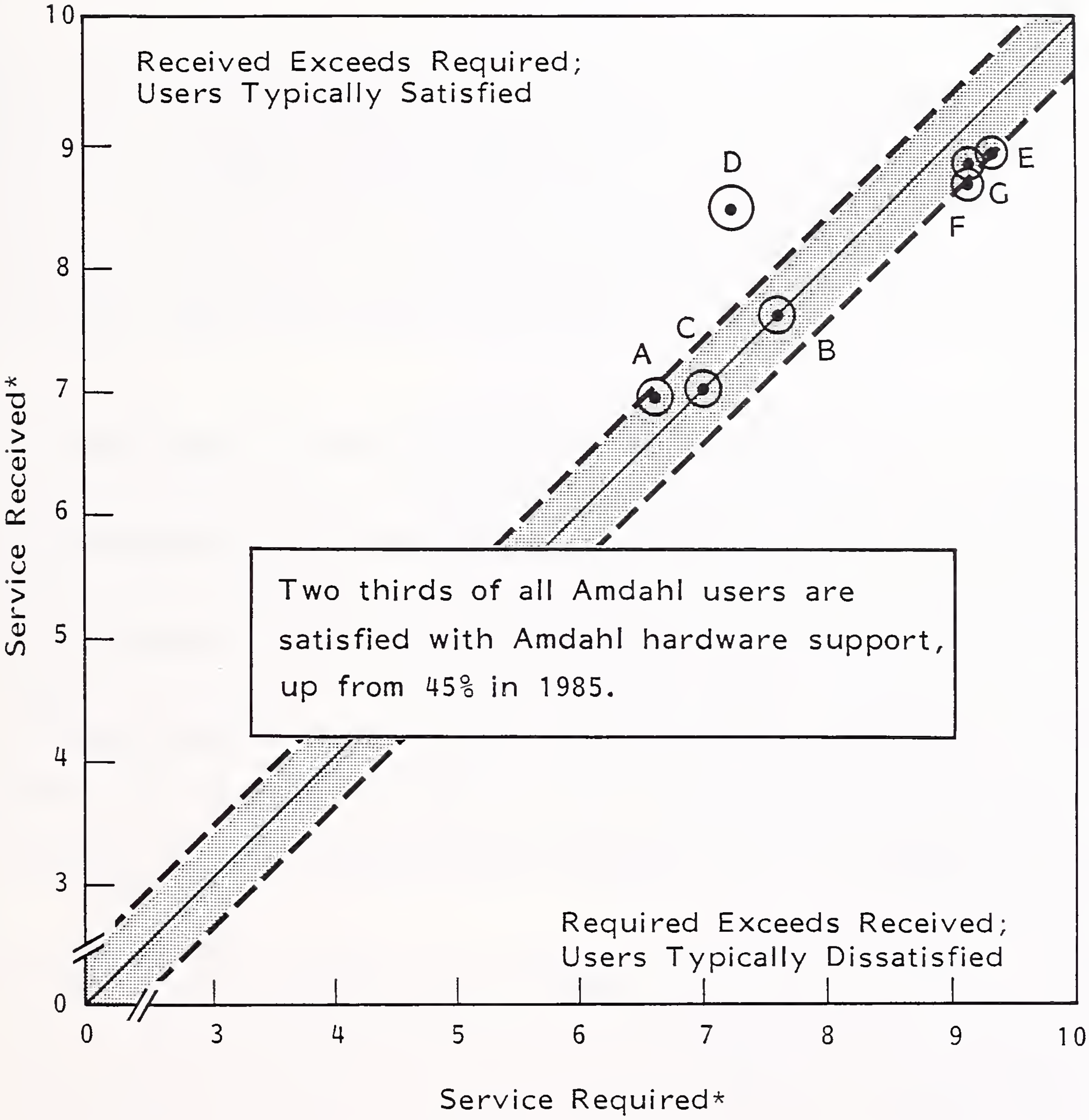


EXHIBIT III-B-4

HARDWARE SERVICES REQUIRED/RECEIVED
AMDAHL



Two thirds of all Amdahl users are satisfied with Amdahl hardware support, up from 45% in 1985.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

- Although Amdahl is not satisfying all hardware service requests, INPUT believes that overall customer satisfaction is high because of the substantial gains made over 1985. In 1985, Amdahl users' satisfaction continued to be impacted by problems the company had with the initial introduction of the 58XX series in 1983-1984. Users perceived the machines as not being as reliable as the 470, and customers were dissatisfied both with the product and the service.

- Current users of the 58XX series of computers are much more satisfied with service despite the fact that service performance, as measured by response and repair time, has not changed dramatically between 1985 and 1986 (see Exhibits III-B-5 and III-B-6). While the number of interruptions has declined from 1985 to 1986, the average response and repair time has only marginally improved.

- Although the user perception of improved hardware service will certainly have some basis in fact, a more damaging perception is that Amdahl does not provide systems software support. Of the 25 Amdahl users interviewed, only three said that they received systems software support from Amdahl. This lack of perceived systems software support is damaging primarily because users are coming to regard software and hardware support as equally important, and the hardware manufacturer typically is held responsible even when the systems software is the cause of a failure. In addition to the impact on customer satisfaction, systems software support can be a major source of service revenue.

- INPUT is not suggesting that Amdahl is not providing systems software support, but rather that their users perceive Amdahl as their secondary source of software service after IBM. INPUT believes that Amdahl must alter this perception if the company is to maintain control over customer satisfaction.

- Exhibit III-B-7 demonstrates that Amdahl users are willing to become involved in some aspects of maintenance, notably diagnostics and some software

EXHIBIT III-B-5

SERVICE PERFORMANCE
AMDAHL

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	97.7%	99.2%
Average Number of Interruptions		
Per Month (Number)	2.3	1.6
Percent Hardware Caused	57%	57%
Percent Software Caused	39%	39%
Average Hardware Response Time (Hours)	1.2 hr.	0.9 hr.
Average Hardware Repair Time (Hours)	2.2 hr.	2.1 hr.
Average Systems Software Response Time (Hours)	N/A	N/A
Average Systems Software Repair Time (Hours)	N/A	N/A

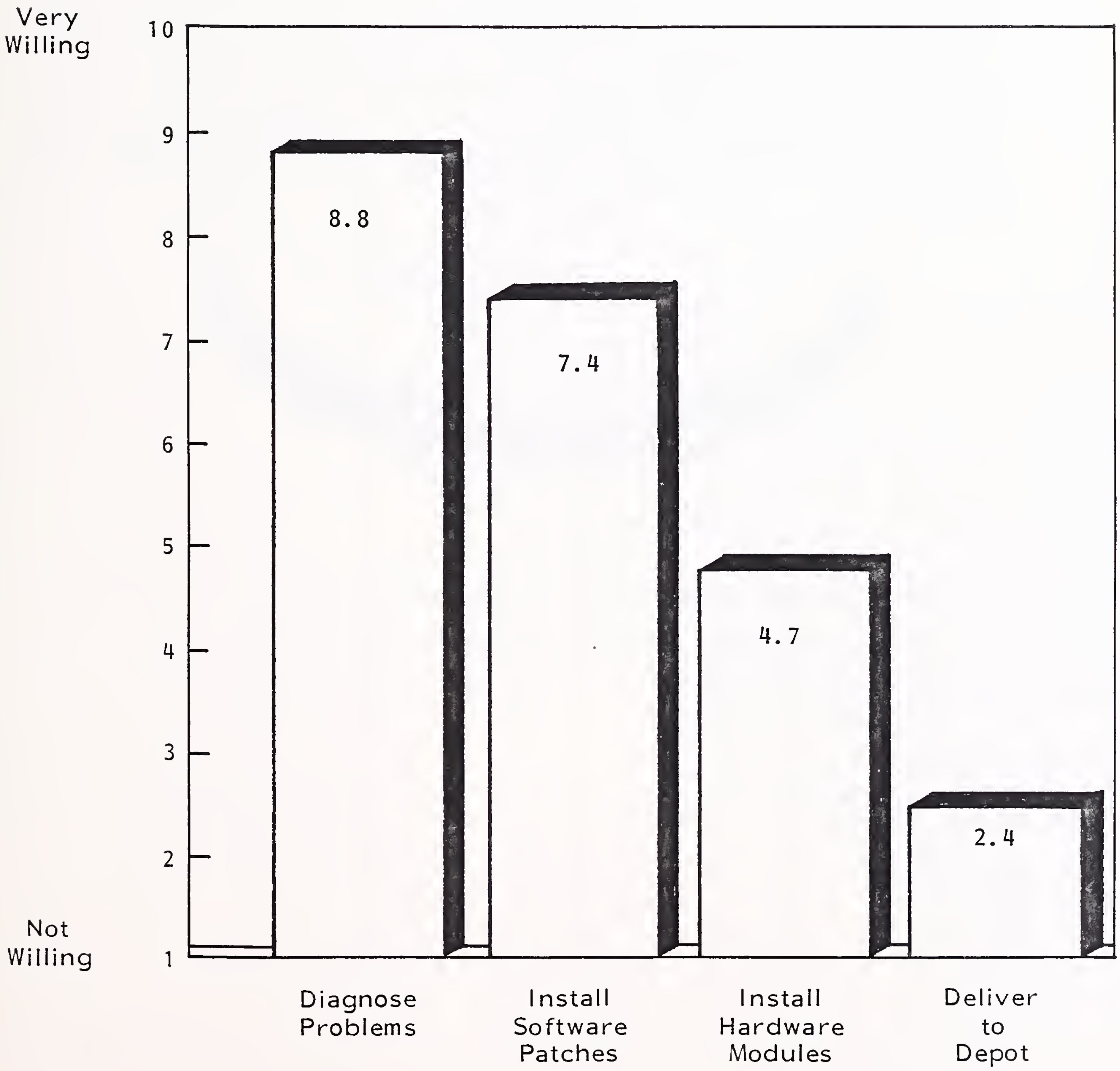
EXHIBIT III-B-6

USER EXPECTATIONS FOR SERVICE PERFORMANCE
AMDAHL

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent)	
		Falls Short of Expectations 40% 30 20 10	Exceeds Expectations 10 20 30 40%
System Availability (Percent)	98.6		1%
Hardware Response Time (Hours)	1.3 hr.		31%
Hardware Repair Time (Hours)	2.7 hr.		22%
Systems Software Response Time (Hours)	N/A		
Systems Software Repair Time (Hours)	N/A		

EXHIBIT III-B-7

USER WILLINGNESS TO PERFORM MAINTENANCE
AMDAHL



* Average Standard Error: 0.6

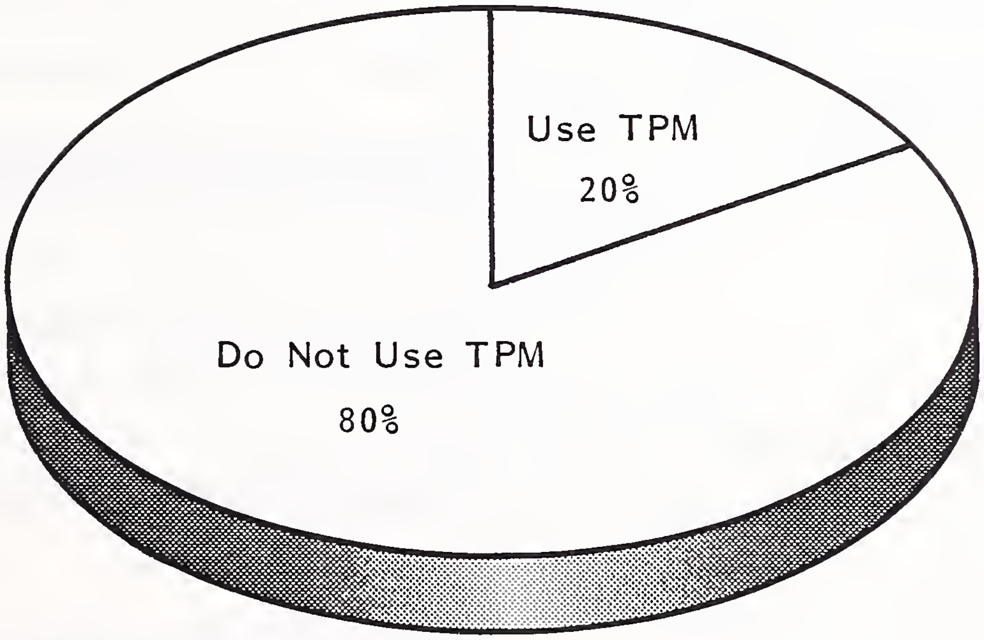
support. This is very similar to other large systems users in that Amdahl customers typically perform some types of maintenance already, but they do not wish to get involved in actual hardware repairs.

- Use of third-party maintenance, demonstrated in Exhibit III-B-8, is stable at about 20% of the Amdahl sample. The most common products serviced by TPM vendors at Amdahl sites were terminals and disk drives.

- Amdahl users have a very substantial requirement for extended services, as shown in Exhibit III-B-9. One hundred percent of the users interviewed said they required at least one extended service and over 80% said they required two or more services. By far the most important extended service to Amdahl users was PM during non-prime hours. Not only did nine out of ten Amdahl users require this service, but it was ranked as the most important of the services listed.

EXHIBIT III-B-8

CURRENT TPM USE
AMDAHL



20% of Amdahl users report they are using third-party maintenance on at least one piece of DP equipment - - no change from 1985.

EXHIBIT III-B-9

USER REQUIREMENTS FOR EXTENDED SERVICES
AMDAHL

SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT* Low High 1 2 3 4 5 6 7 8 9 10
Preventive Maintenance during Non-Prime Hours	88%	9.3
Remote Diagnostics	76	8.6
Under Two-Hour Response	80	9.7
Standby Coverage	76	9.0
Maintenance Management	28	8.6
Deferred Response	8	7.5

*Average Standard Error: 0.3

III C. NATIONAL ADVANCED SYSTEMS

- Twenty-five NAS 90X0 mainframe users were interviewed in February 1986. All interviews were conducted by telephone with the data processing or operations manager at each site. The average interview lasted 15-20 minutes.

- NAS users continue to be among the most satisfied in the large systems environment. As Exhibit III-C-1 demonstrates, there have been some minor changes in NAS service, but overall hardware service in 1986 is very similar in performance level to 1985. Parts availability continues to be a problem, as shown in Exhibit III-C-2. NAS has been very active over the last few years in redesigning their logistics operations. Users, however, clearly do not appreciate the increased logistics efficiency; in fact, there is a growing perception of a decline in parts availability.

- The parts availability problem has had an impact on both the users' perception of engineer skill level and overall service ratings. User satisfaction levels in these areas, as shown in Exhibit III-C-3, are among the lowest of all hardware service categories for NAS users. In fact, NAS user satisfaction with hardware service has fallen from 1985 to 1986 in five out of the six categories surveyed. As with other mainframe vendors, this growing level of dissatisfaction with hardware service is not the result of declining service performance. As will be shown below, measurable service performance has actually improved. However, user expectations for service have increased and dissatisfaction has resulted when NAS has not met these expectations.

- Exhibit III-C-4 graphically demonstrates that in most hardware service categories, NAS continues to exceed user expectations for service. However, in the service areas with the highest user requirements (engineer skill level, parts availability, and service overall), user need for service is higher than the level of service delivered by NAS.

EXHIBIT III-C-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
NAS

HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE		USER RATING*	
	Decline -1.5 -1.0 -0.5	Improve 0.5 1.0 1.5	1985	1986†
Consulting		0.5	7.7	8.2
Engineer Skill Level		0.3	8.8	9.1
Parts Availability	0	0	8.3	8.3
Service Overall	-0.3		8.9	8.6
Documentation	-0.3		8.3	8.0
Training	-0.4		8.1	7.8

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-C-2

1986 USER HARDWARE SERVICE RATINGS
NAS

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Parts Availability	▨ 9.5	▨ 8.3	▨ (1.2)
Engineer Skill Level	▨ 9.5	▨ 9.1	▨ (0.4)
Hardware Service Overall	▨ 9.3	▨ 8.6	▨ (0.7)
Consulting	7.8	8.2	0.4
Documentation	7.7	8.0	0.3
Training	7.7	7.8	0.1
Remote Support	6.6	8.1	1.5

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-C-3

USER SATISFACTION: HARDWARE SERVICE
NAS

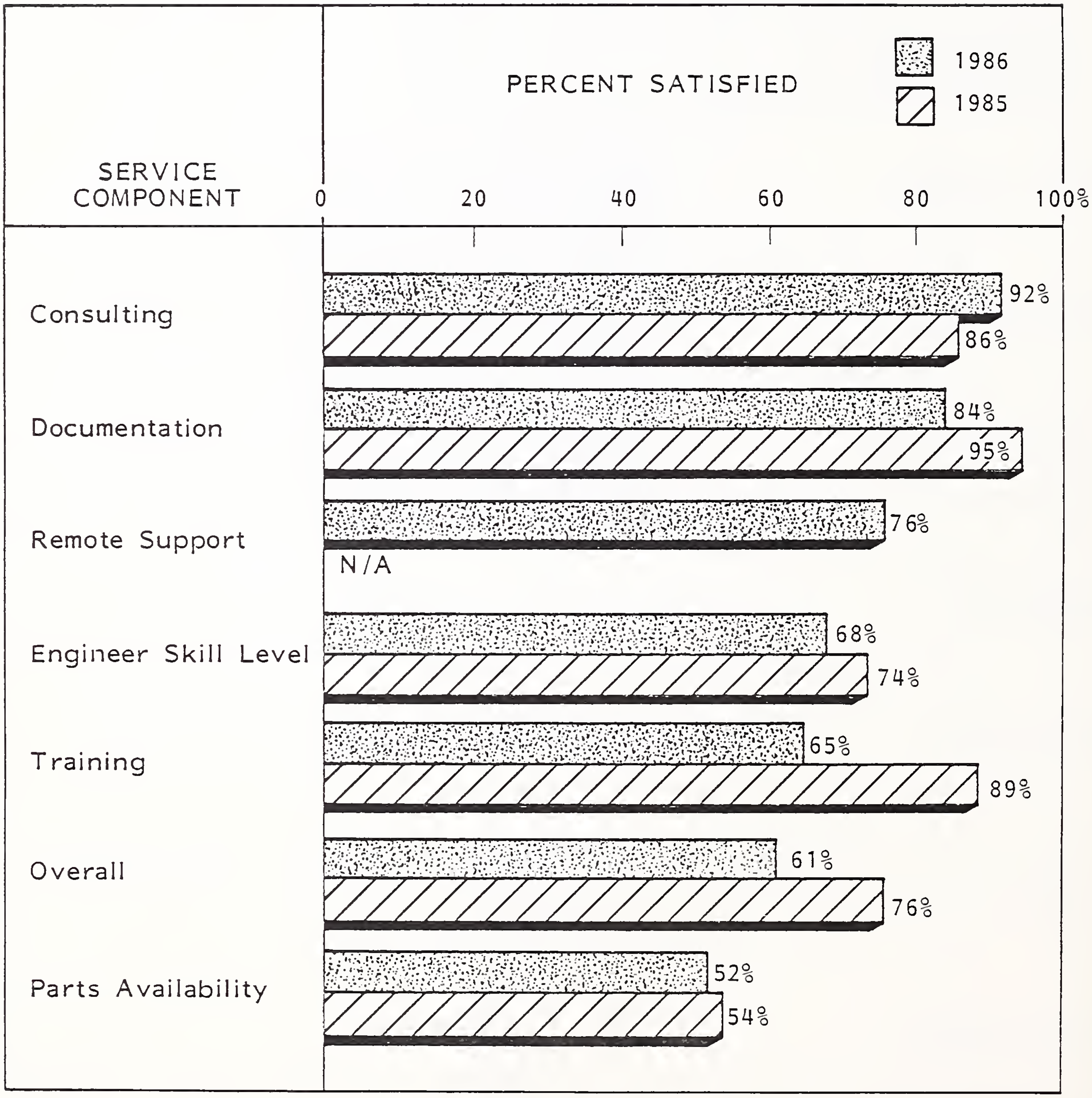
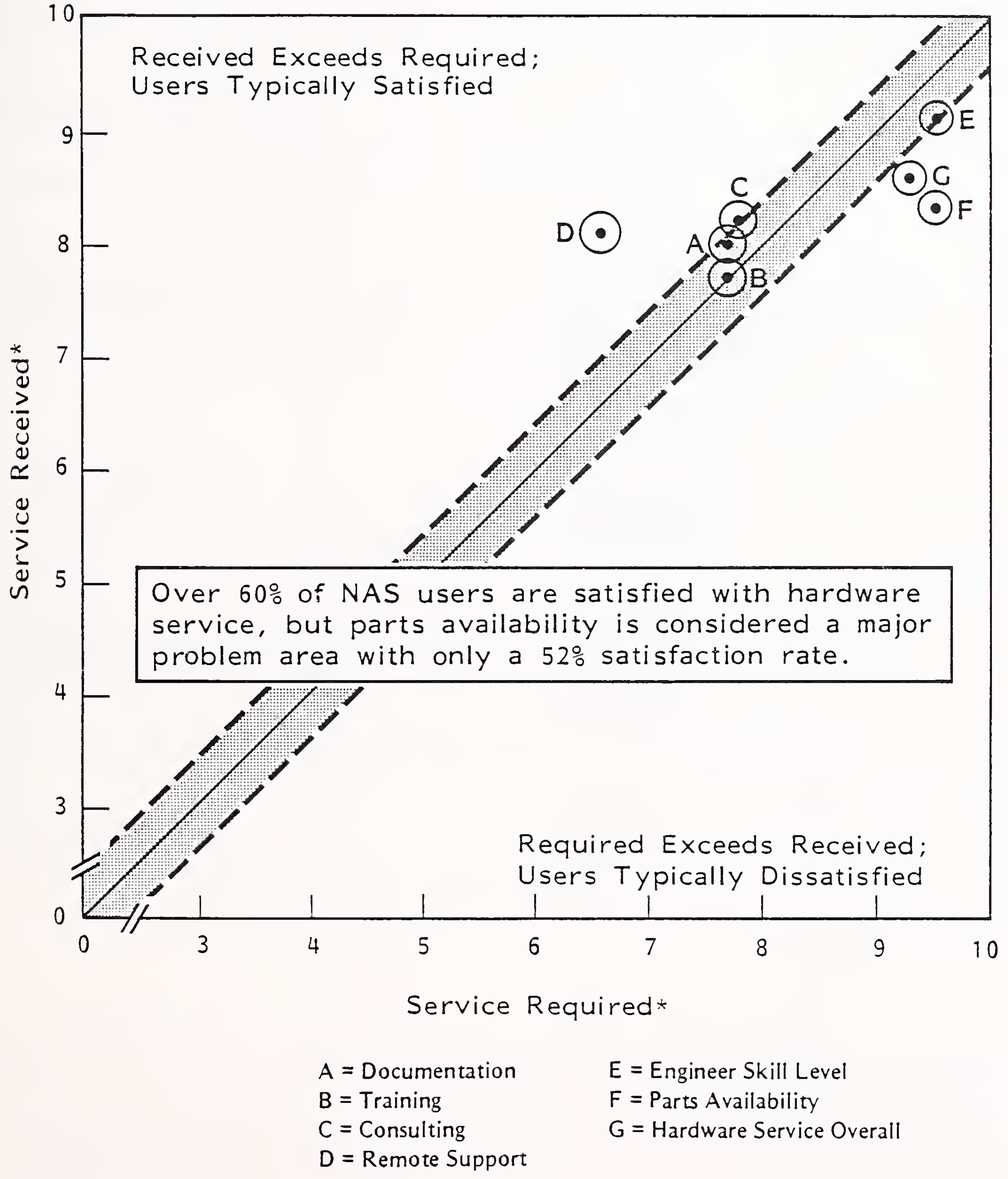


EXHIBIT III-C-4

HARDWARE SERVICES REQUIRED/RECEIVED
NAS



Over 60% of NAS users are satisfied with hardware service, but parts availability is considered a major problem area with only a 52% satisfaction rate.

* Rating: 1 = Low, 10 = High

- While NAS users have expressed some concern about hardware service, systems software service from NAS has improved dramatically in 1986. As Exhibit III-C-5 demonstrates, NAS users reported improved service in all of the five key systems software support areas. Substantial gains were made in both systems software consulting and the skill level of software engineers. NAS clearly targeted these key support areas. Exhibit III-C-6 shows that NAS met or exceeded every systems software user requirement for service and that the highest level of support was directed at the most important services.

- Not surprisingly, customer satisfaction with NAS systems software service is quite high (see Exhibit III-C-7). Overall satisfaction with NAS systems software support is 81%, significantly higher than the average for large systems vendors (approximately 55%). INPUT believes that the users' perceptions of better software engineers combined with improved escalation operations and custom consulting have been instrumental in maintaining the high levels of satisfaction with systems software.

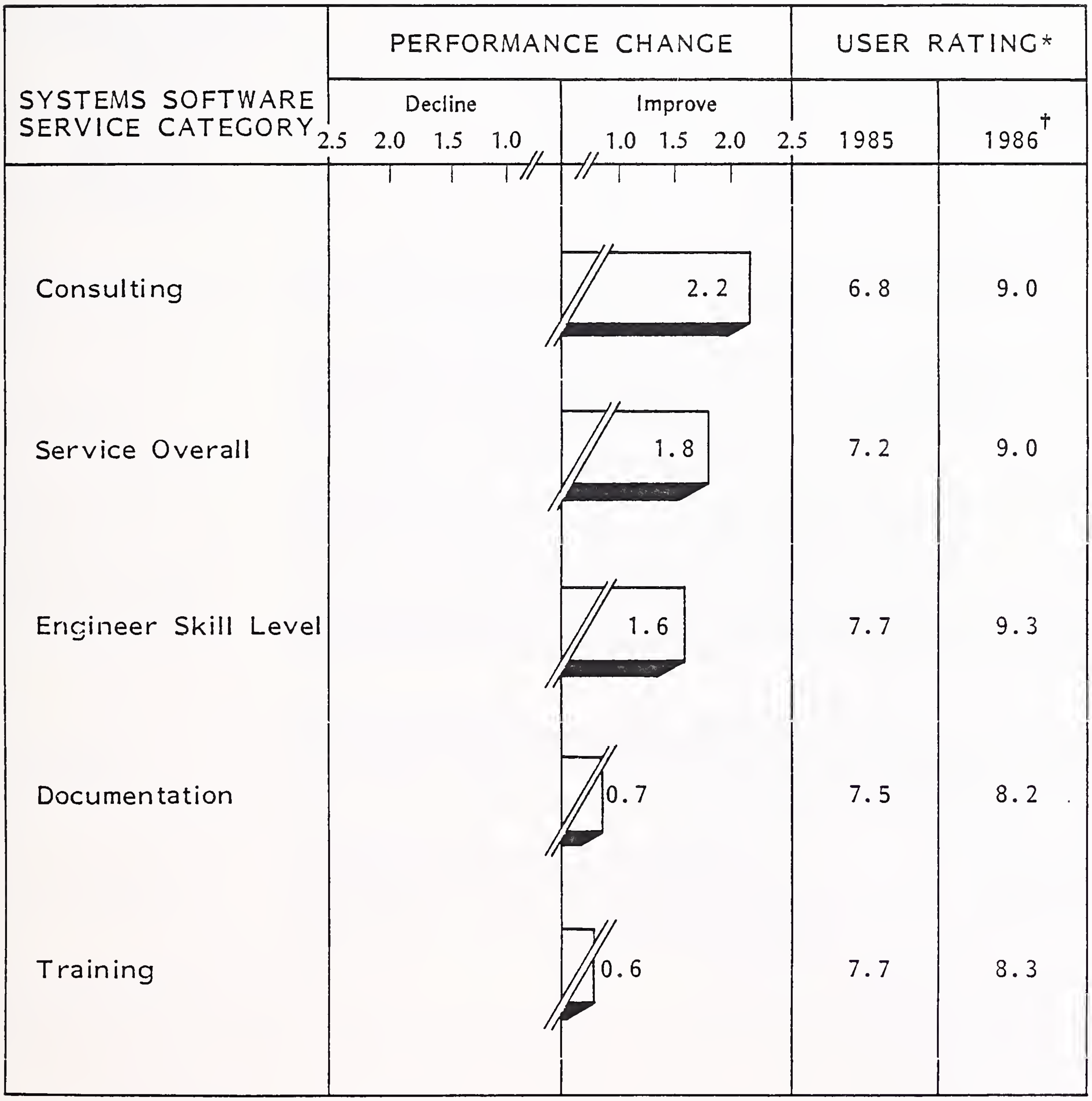
- It is significant that the relatively low levels of satisfaction with systems software documentation (56%) have not dramatically impacted overall satisfaction among NAS users. Among other large systems user groups, notably CDC and Sperry, high levels of dissatisfaction with systems software documentation has had a major impact on overall satisfaction rates. While NAS users are not totally satisfied with documentation, they typically look to the manufacturer of the software (usually IBM) for improvements.

- Exhibit III-C-8 demonstrates the basic cause of the high satisfaction levels among NAS systems software users--NAS meets or exceeds all user requirements for service.

- Actual service performance is demonstrated in Exhibit III-C-9. As noted earlier, service performance has improved marginally in areas such as average number of system interruptions per month and systems software response time. The only decline in service, as shown in Exhibit III-C-10, is hardware

EXHIBIT III-C-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
NAS



SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE		USER RATING*	
	Decline	Improve	1985	1986†
Consulting		2.2	6.8	9.0
Service Overall		1.8	7.2	9.0
Engineer Skill Level		1.6	7.7	9.3
Documentation		0.7	7.5	8.2
Training		0.6	7.7	8.3

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-C-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
NAS

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Engineer Skill Level	8.3	9.3	1.0
Service Overall	8.2	9.0	0.8
Consulting	8.2	9.0	0.8
Documentation	8.2	8.2	-
Remote Support	7.8	7.8	-
Training	7.6	8.3	0.7

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-C-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
NAS

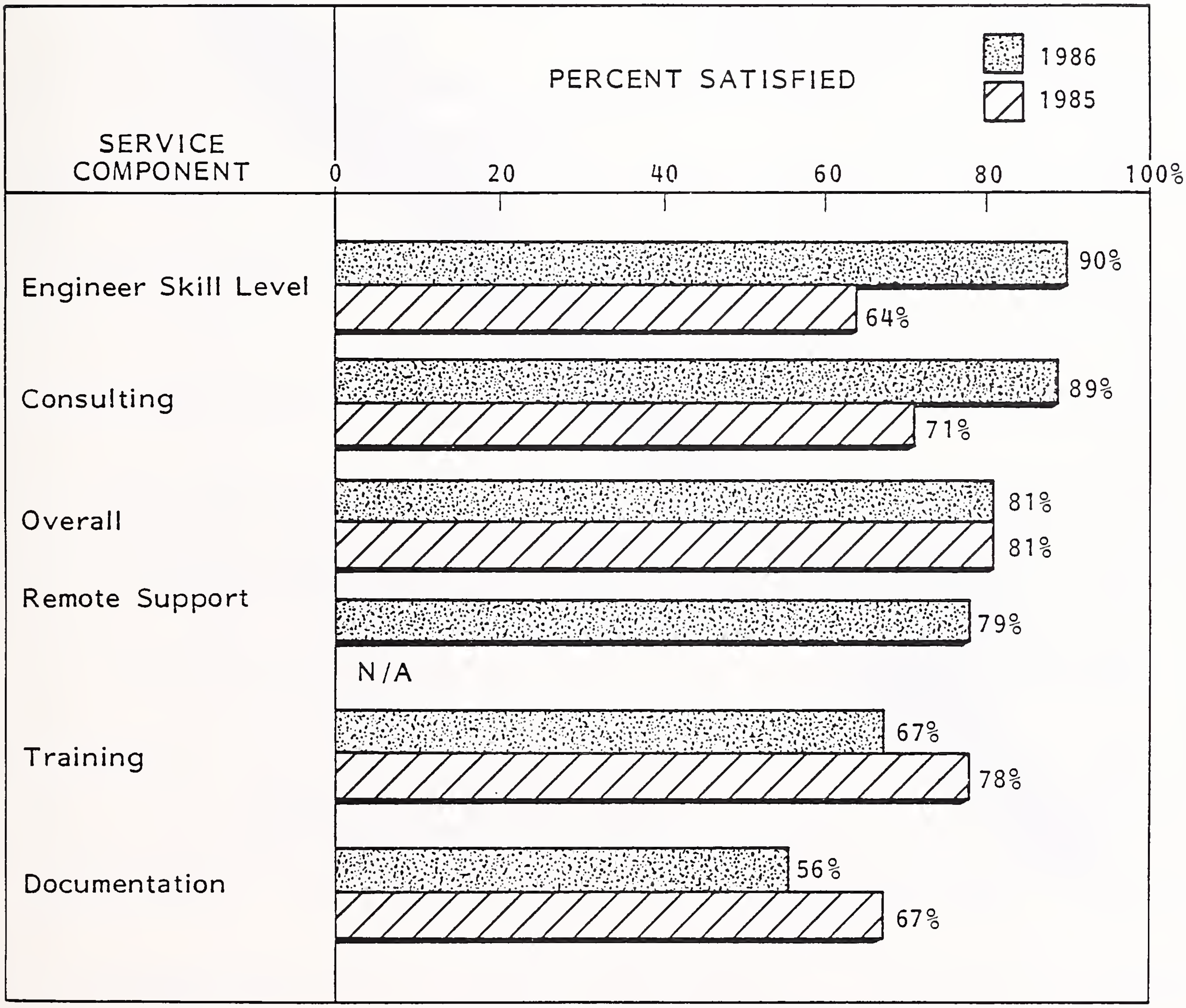
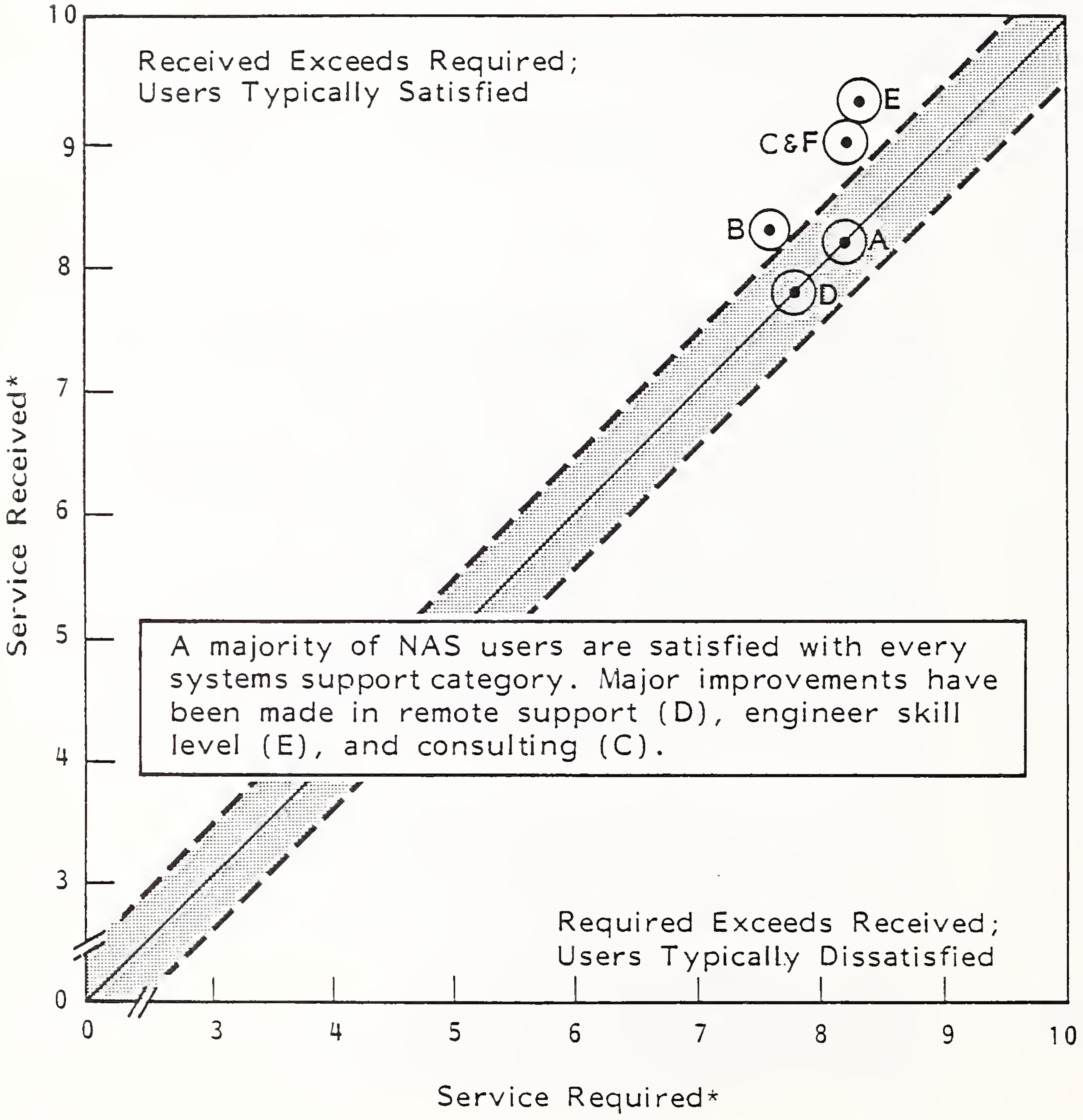


EXHIBIT III-C-8

SYSTEMS SOFTWARE SERVICE REQUIRED/RECEIVED
NAS



A majority of NAS users are satisfied with every systems support category. Major improvements have been made in remote support (D), engineer skill level (E), and consulting (C).

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-C-9

SERVICE PERFORMANCE
NAS

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	99.2%	99.6%
Average Number of Interruptions		
Per Month (Number)	1.0	0.6
Percent Hardware Caused	27.0%	68.7%
Percent Software Caused	60.0%	31.2%
Average Hardware Response Time (Hours)	1.1 hr.	1.0 hr.
Average Hardware Repair Time (Hours)	2.1 hr.	2.6 hr.
Average Systems Software Response Time (Hours)	6.1 hr.	1.1 hr.
Average Systems Software Repair Time (Hours)	1.3 hr.	1.3 hr.

EXHIBIT III-C-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE
NAS

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent)	
		Falls Short of Expectations 40% 30 20 10	Exceeds Expectations 10 20 40 50%
System Availability (Percent)	99.2	0	0
Hardware Response Time (Hours)	1.2		17%
Hardware Repair Time (Hours)	2.2	18%	
Systems Software Response Time (Hours)	1.7		35%
Systems Software Repair Time (Hours)	2.6		50%

repair time, and, with a standard error of 0.7 hours, even this is not statistically significant.

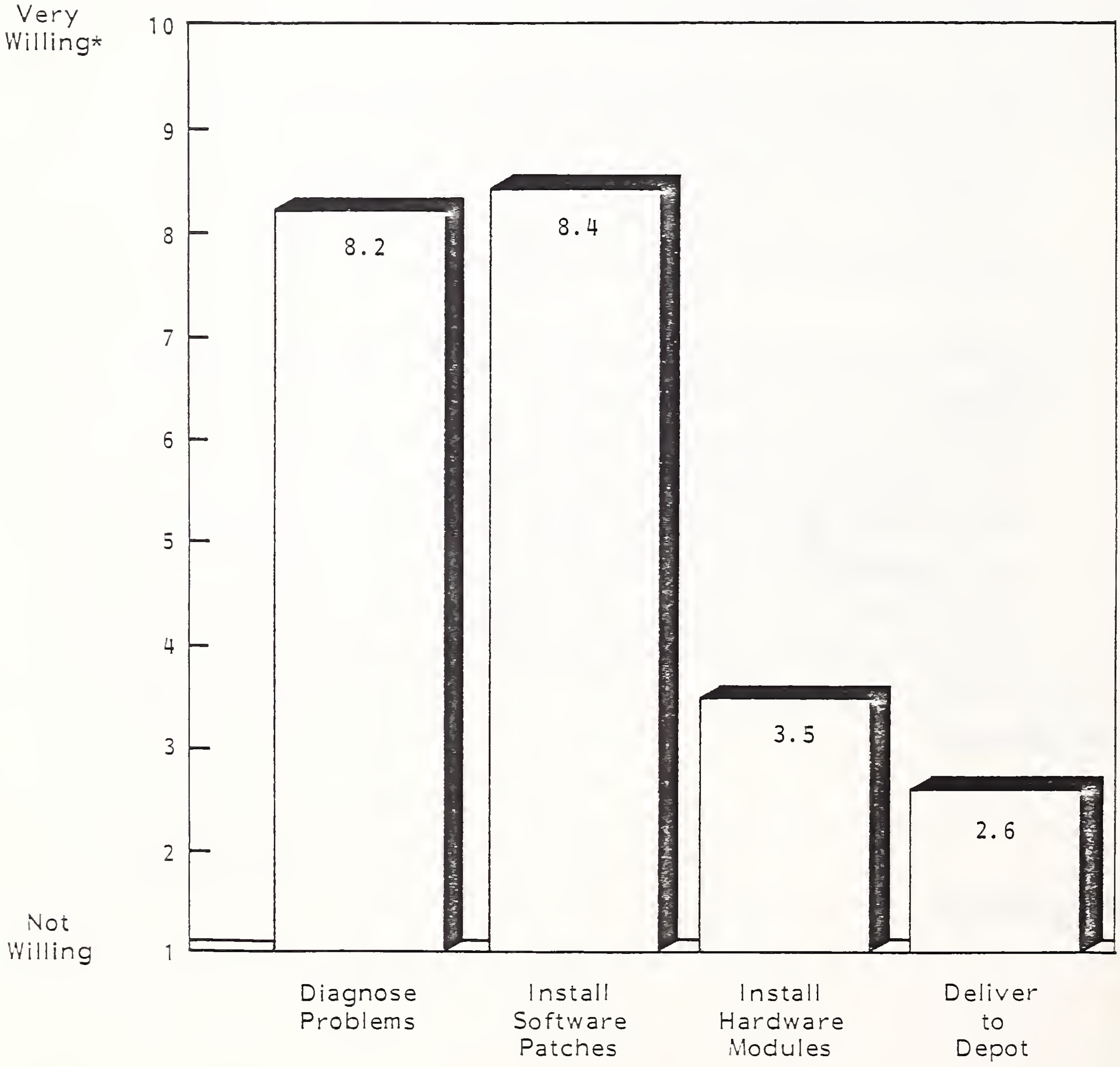
- User willingness to be involved in and perform maintenance is shown in Exhibit III-C-11. Not surprisingly, most NAS users are willing to become involved in diagnosing problems and installing software patches; they are performing these functions already. Very few NAS users expressed any interest in delivering equipment (terminals, etc.) to a depot or being involved in the installation of hardware modules. Clearly, because the service they are receiving is so high, many users prefer leaving hardware maintenance to NAS.

- The use of third-party maintenance at NAS sites (although not on the NAS CPU) is demonstrated in Exhibit III-C-12. Forty-four percent of NAS users say they use TPM vendors for at least one piece of data processing equipment at their site, up from 39% in 1985. This is significantly higher than NAS' two major competitors (IBM and Amdahl), both of whom have 20% TPM usage.

- As NAS users' expectations for service continue to grow, INPUT expects that the requirement for extended services will grow as well. Exhibit III-C-13 demonstrates that a majority of NAS users currently require three extended services (standby coverage, PM during non-prime hours, and under two-hour response time). As the user base continues to become more diversified, NAS must be willing to make a variety of service products available to meet the service needs of each segment. In addition to improving customer satisfaction, INPUT believes that the increased service flexibility will also lead to substantial revenue gains.

EXHIBIT III-C-11

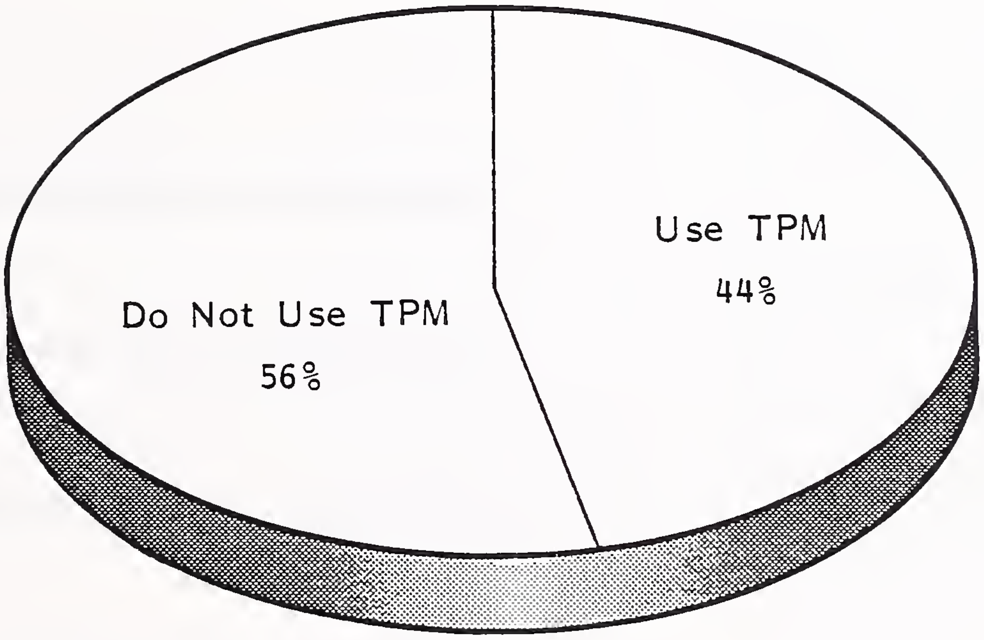
USER WILLINGNESS TO PERFORM MAINTENANCE
NAS



* Average Standard Error: 0.6

EXHIBIT III-C-12

CURRENT TPM USE
NAS



44% of NAS users have TPM support on at least one piece of DP equipment -- up from 39% in 1985.

EXHIBIT III-C-13

USER REQUIREMENTS FOR EXTENDED SERVICES
NAS

SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT* (Low 1 2 3 4 5 6 7 8 9 10 High)
Preventive Maintenance during Non-Prime Hours	84%	9.5
Under Two-Hour Response	60	8.8
Standby Coverage	56	9.1
Remote Diagnostics	36	7.9
Maintenance Management	24	7.5
Deferred Response	16	7.0

*Average Standard Error: 0.3

III D. CONTROL DATA CORPORATION (CDC)

- Twenty-five CDC large systems users (170/8XX and 180/8XX) were interviewed in 1986. The interviews were conducted by telephone in March 1986 and each interview lasted an average of 20 minutes. The vast majority of respondents (over 75%) were data processing or operations managers. The CDC survey is weighed by industry in three areas: education (48% of all interviews), manufacturing (32%), and government (16%).

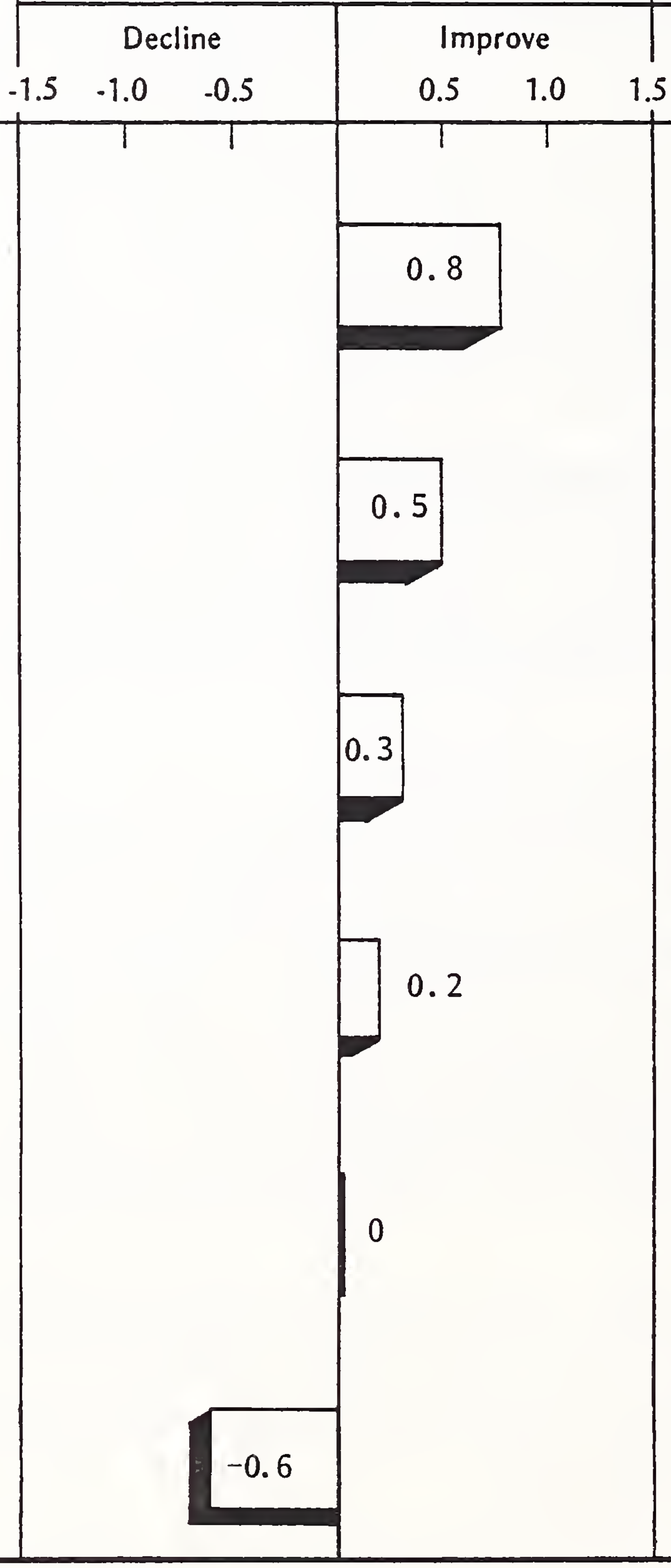
- User ratings of CDC hardware service performance have been generally favorable, as shown in Exhibit III-D-1. The company made significant gains in both consulting and training between 1985 and 1986, although users indicated that service declined in the area of hardware documentation. Although CDC users noted generally improved hardware service, Exhibit III-D-2 indicates that not all user expectations for service are being met. As with a number of other large systems vendors, CDC is experiencing very high user requirements for parts availability. Users increasingly see parts availability as the source of downtime as vendors restrict local stacking of parts and on-site component repair.

- Parts availability is the most important hardware support category according to CDC users, and the company's inability to meet user expectations in this area has had a noticeable impact on customer satisfaction. Exhibit III-D-3 demonstrates that despite satisfaction in the 75-85% range for most hardware services, overall satisfaction is significantly lower. There is a high correlation between parts availability and overall satisfaction, and the company must address this crucial issue if satisfaction rates are to continue to improve.

- Significantly, CDC has improved customer satisfaction in every hardware service category from 1985 to 1986. Exhibit III-D-4 graphically demonstrates that the company exceeds user expectations for service in four of the top seven service categories.

EXHIBIT III-D-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
CDC



HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING* 1985	USER RATING* 1986†
Consulting	0.8	6.8	7.6
Training	0.5	6.9	7.4
Parts Availability	0.3	7.6	7.9
Engineer Skill Level	0.2	7.9	8.1
Services Overall	0	8.1	8.1
Documentation	-0.6	7.4	6.8

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.3

EXHIBIT III-D-2

1986 USER HARDWARE SERVICE RATINGS
CDC

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Parts Availability	9.0	7.9	(1.1)
Hardware Service Overall	8.6	8.1	(0.5)
Engineer Skill Level	8.6	8.1	(0.5)
Consulting	6.8	7.6	0.8
Training	6.1	7.4	1.3
Documentation	6.0	6.8	0.8
Remote Support	5.6	7.7	2.1

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error:

EXHIBIT III-D-3

USER SATISFACTION: HARDWARE SERVICES
CDC

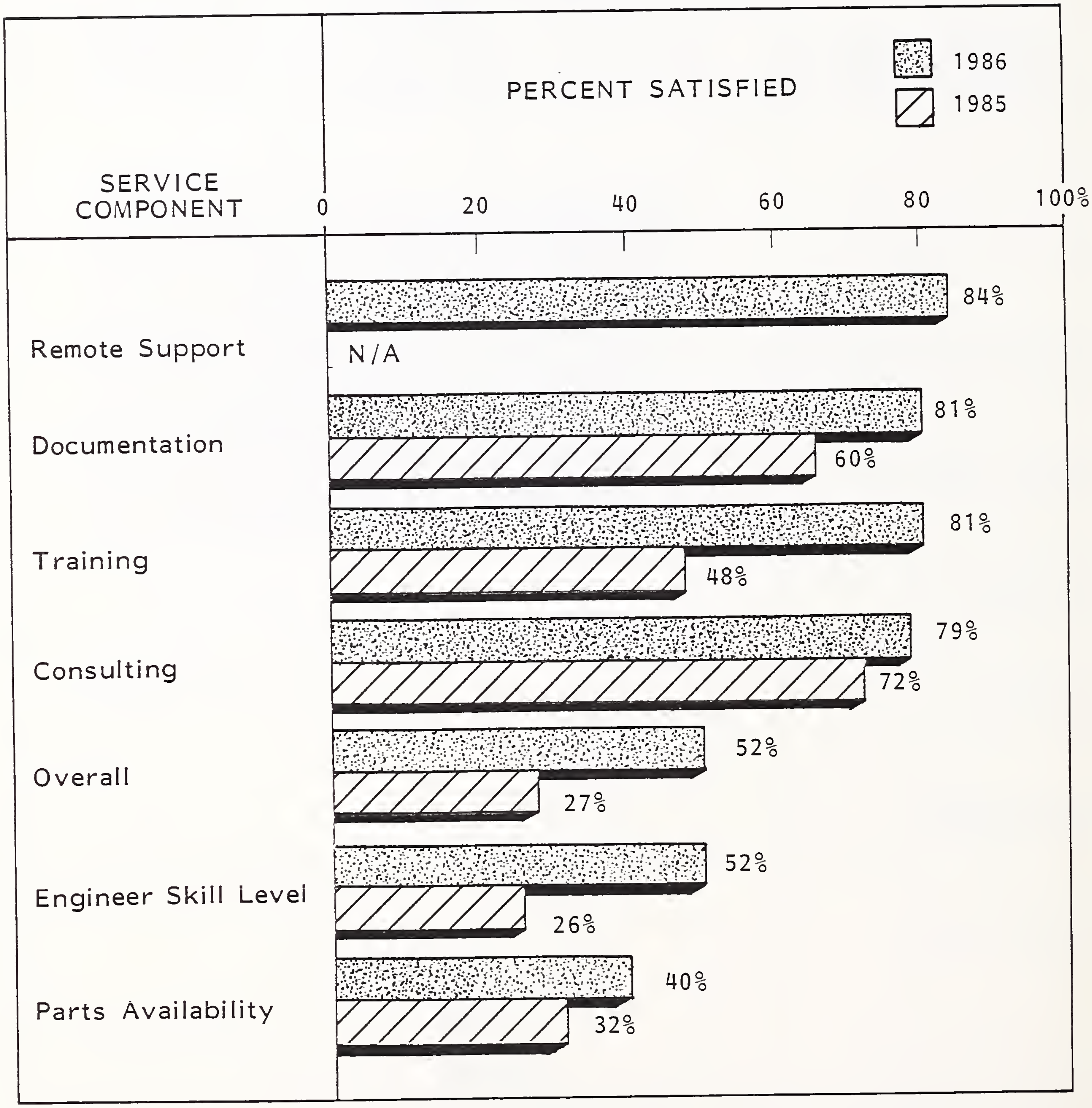
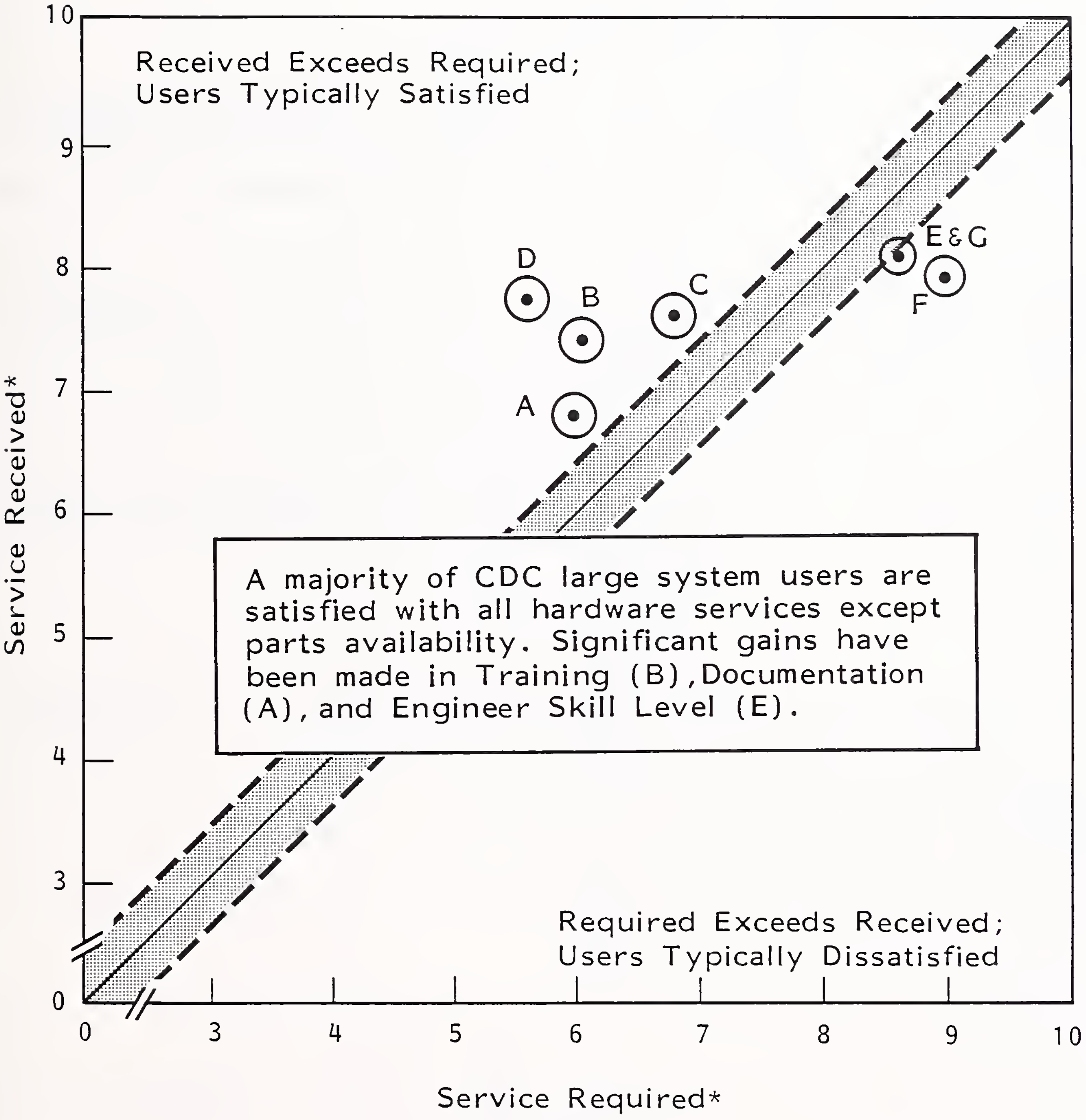


EXHIBIT III-D-4

HARDWARE SERVICES REQUIRED/RECEIVED
CDC



A majority of CDC large system users are satisfied with all hardware services except parts availability. Significant gains have been made in Training (B), Documentation (A), and Engineer Skill Level (E).

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

- Gains in user satisfaction with systems software support have not been as dramatic as in the hardware arena. Exhibit III-D-5 demonstrates that users rated most services at the same level in 1986 as in 1985, although there was a decline mentioned in systems software documentation. Exhibit III-D-6 shows that CDC did not exceed user expectations for systems software support in any of the six major service categories.

- As a result of the vendor not meeting user expectations for service, satisfaction with systems software support from CDC (see Exhibit III-D-7) is quite low. Only about one in five users are satisfied with the company's documentation and one in three are satisfied with overall systems software support. What is more alarming, however, is that these low satisfaction rates have remained stagnant compared to last year. INPUT strongly believes that the customer must perceive a commitment by the vendor in systems software support before satisfaction rates will improve, but that perception does not yet exist among a very large group of CDC users. Exhibit III-D-8 demonstrates the substantial variance between user requirements for service and the level of systems software support received.

- Despite the fact that users are not satisfied with systems software support, most reported considerable gains in service performance. Exhibit III-D-9 demonstrates that systems software response time improved by 74% and repair time improved by over 50% from 1985 to 1986. In addition, system availability improved and the number of monthly interruptions declined.

- The reason that satisfaction was not impacted by improvements in service is demonstrated in Exhibit III-D-10. User expectations for response and repair times, particularly in software support, have increased dramatically. In 1985 users received an average systems software response time of over 18 hours, but today they expect a three hour response time. Even though the company has improved service in this area, user demand just keeps on growing. As a result, CDC users have been more willing than most to become involved in

EXHIBIT III-D-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
CDC

SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE		USER RATING*	
	Decline -1.5 -1.0 -0.5	Improve 0.5 1.0 1.5	1985	1986†
Consulting		0.2	7.1	7.3
Engineer Skill Level	-0.1		7.1	7.1
Training	-0.1		6.9	6.8
Service Overall	-0.2		7.0	6.8
Documentation	-0.6		7.1	6.5

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-D-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
CDC

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	8.7	6.5	(2.2)
Service Overall	8.4	6.8	(1.6)
Engineer Skill Level	8.4	7.1	(1.3)
Remote Support	8.1	7.1	(1.0)
Consulting	7.3	7.3	-
Training	7.2	6.8	(0.4)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-D-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
CDC

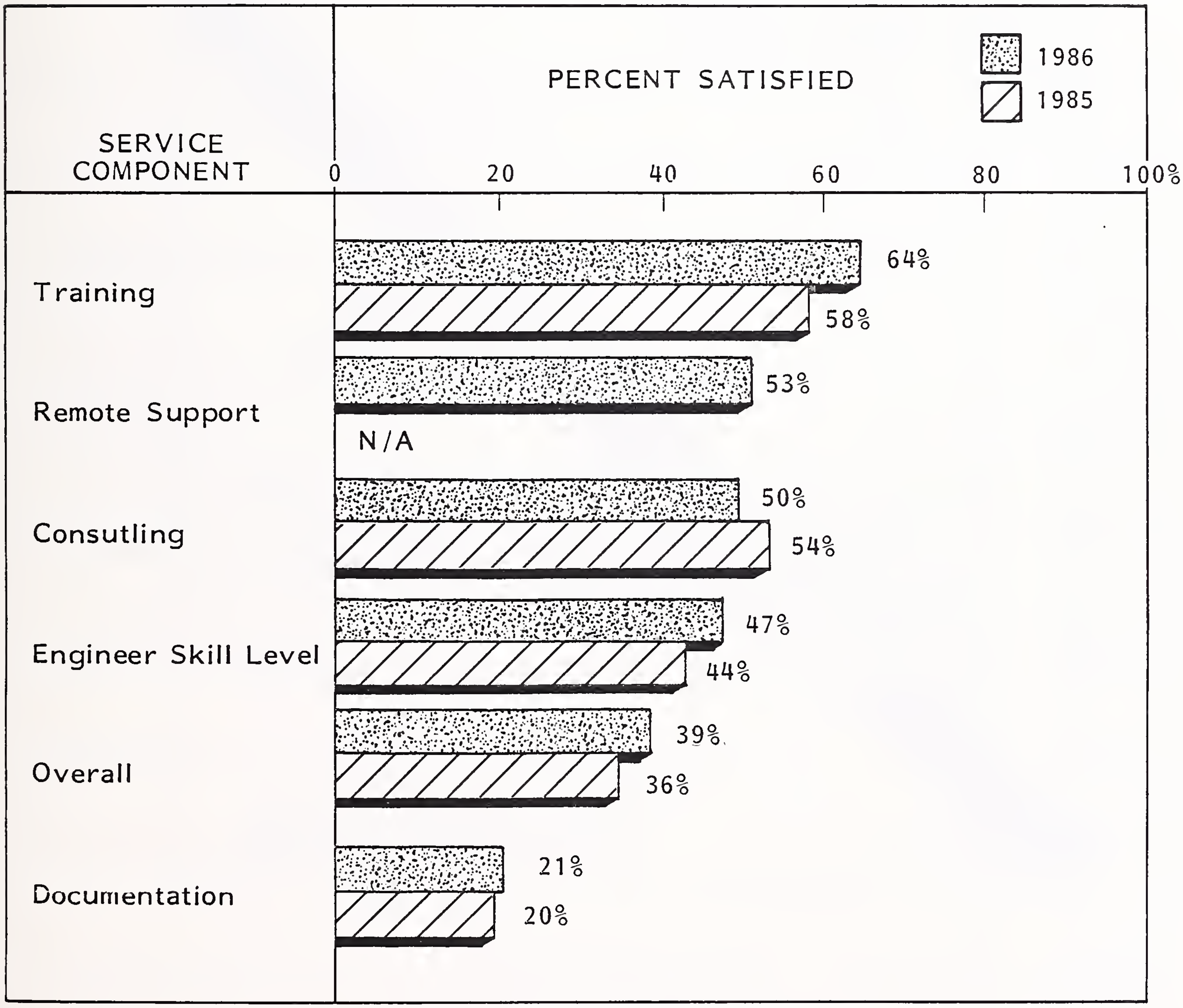
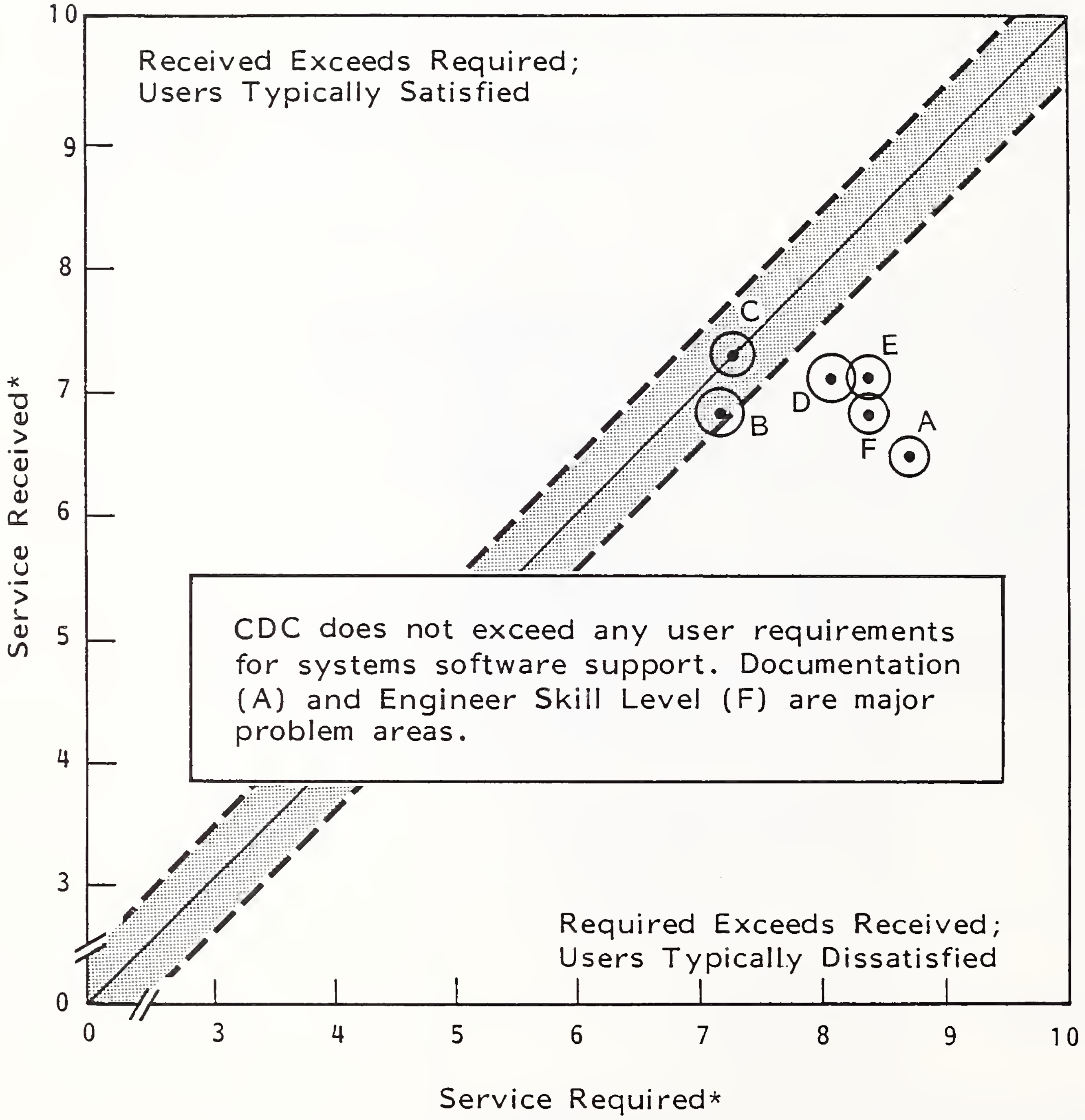


EXHIBIT III-D-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
CDC



Received Exceeds Required;
Users Typically Satisfied

CDC does not exceed any user requirements for systems software support. Documentation (A) and Engineer Skill Level (F) are major problem areas.

Required Exceeds Received;
Users Typically Dissatisfied

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

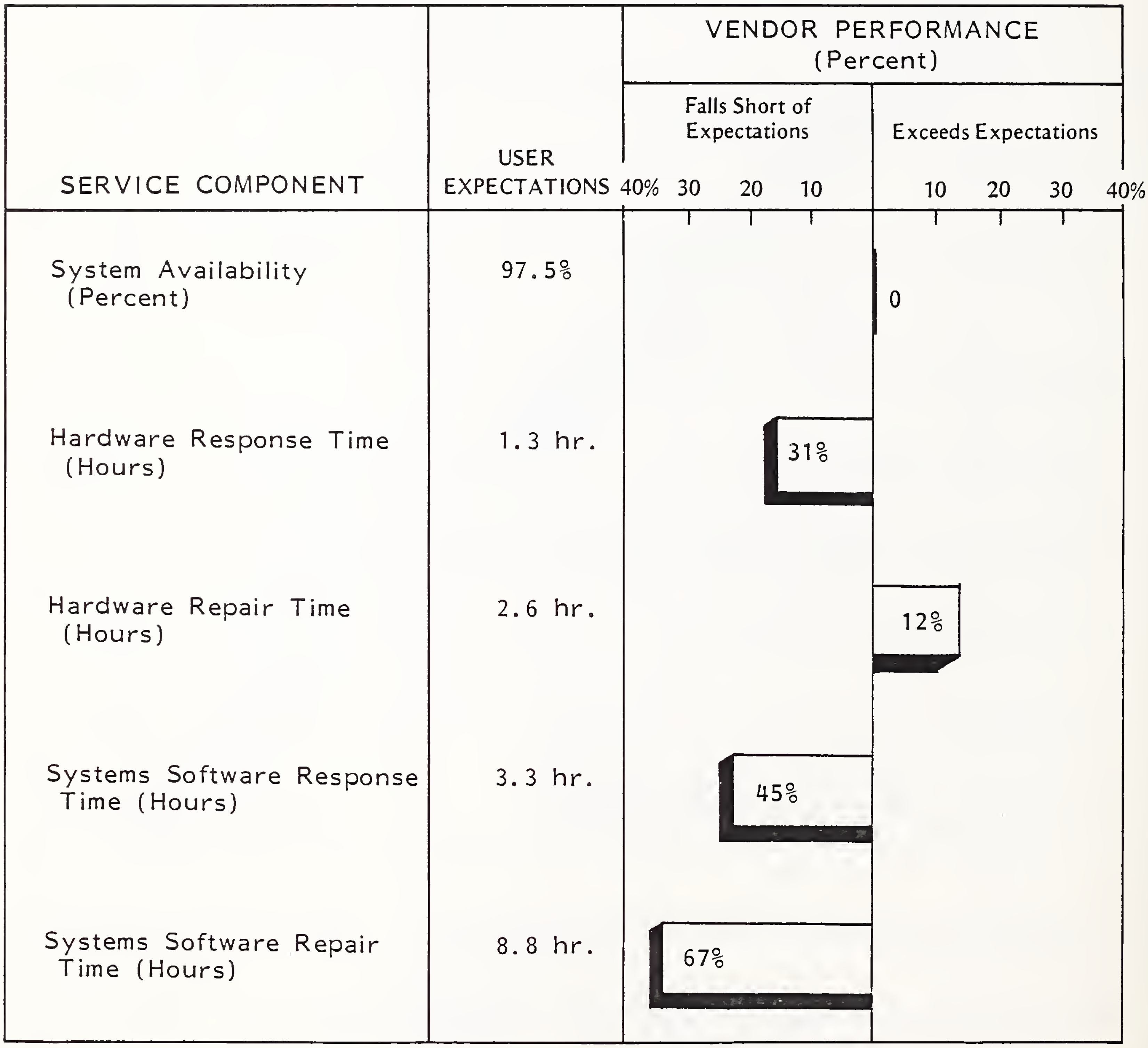
EXHIBIT III-D-9

SERVICE PERFORMANCE
CDC

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	95.4%	97.4%
Average Number of Interruptions		
Per Month (Number)	3.3	2.9
Percent Hardware Caused	65.0%	56.0%
Percent Software Caused	22.0%	26.0%
Average Hardware Response Time (Hours)	1.3 hr.	1.7 hr.
Average Hardware Repair Time (Hours)	1.4 hr.	2.3 hr.
Average Systems Software Response Time (Hours)	18.3 hr.	4.8 hr.
Average Systems Software Repair Time (Hours)	30.2 hr.	14.7 hr.

EXHIBIT III-D-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE
CDC



		VENDOR PERFORMANCE (Percent)	
SERVICE COMPONENT	USER EXPECTATIONS	Falls Short of Expectations	Exceeds Expectations
System Availability (Percent)	97.5%		0
Hardware Response Time (Hours)	1.3 hr.	31%	
Hardware Repair Time (Hours)	2.6 hr.		12%
Systems Software Response Time (Hours)	3.3 hr.	45%	
Systems Software Repair Time (Hours)	8.8 hr.	67%	

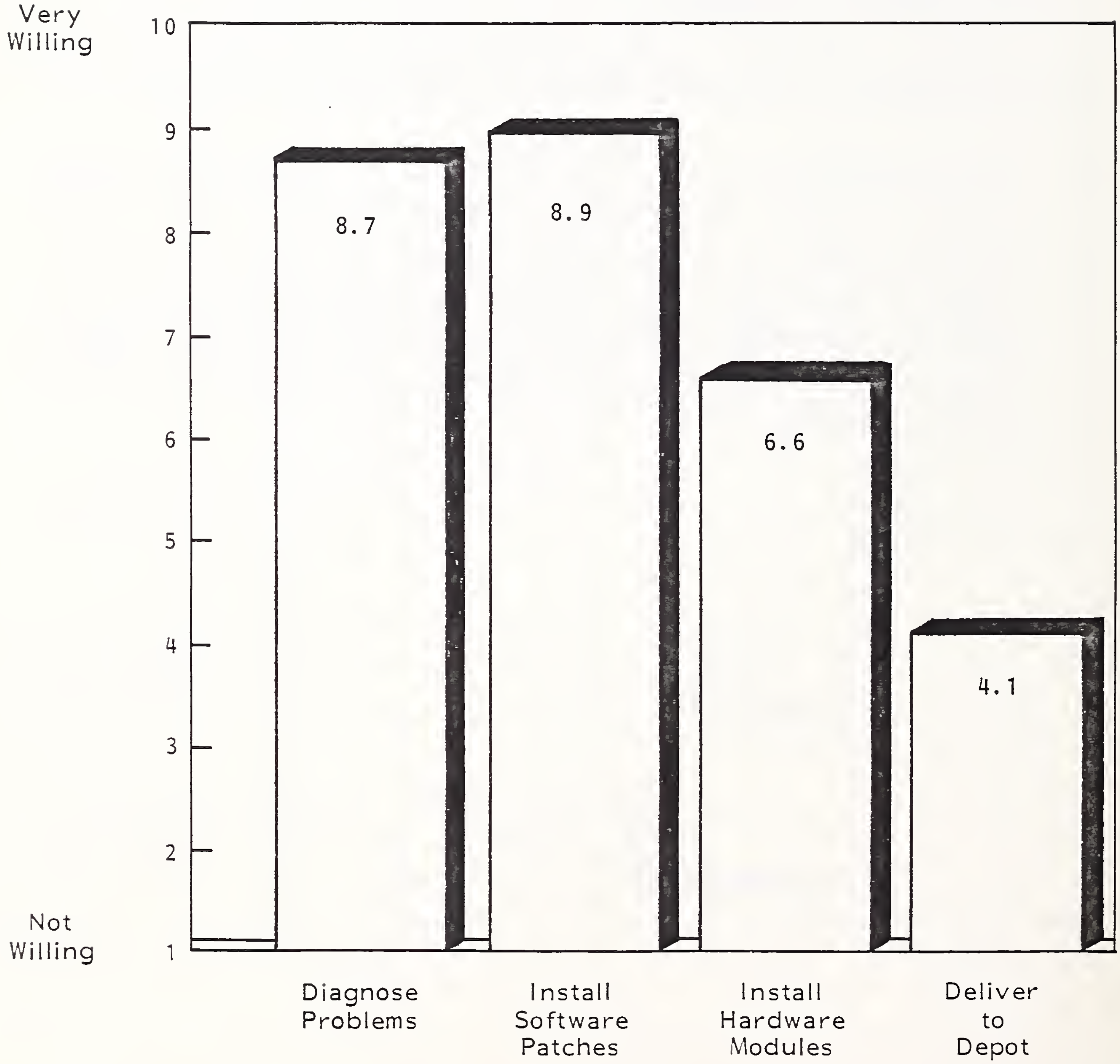
systems software support, as shown in Exhibit III-D-11. Users are very willing to participate in software support tasks such as installing patches and performing diagnostics. Many of the users said they maintain a trained staff for this purpose.

- CDC customers reported the highest use of third-party maintenance of all the large system groups interviewed (see Exhibit III-D-12). A majority of CDC users said they had a TPM contract on at least one piece of data processing equipment at their site. INPUT believes that this is caused, in part, by the fact that CDC often exists in a mixed vendor environment, but also because CDC is a major TPM vendor itself. In the future, INPUT expects the percentage of TPM contracts among CDC users to continue to increase.

- CDC user requirements for extended services are demonstrated in Exhibit III-D-13. This user group exhibited a high requirement for both PM during non-prime hours and an under two-hour response time. While it is difficult to imagine a large systems user accepting PM during prime hours, 20% of CDC users feel this would be acceptable and over 30% say they could accept a response time of over two hours. Segmentation of the CDC user base is clearly taking place.

EXHIBIT III-D-11

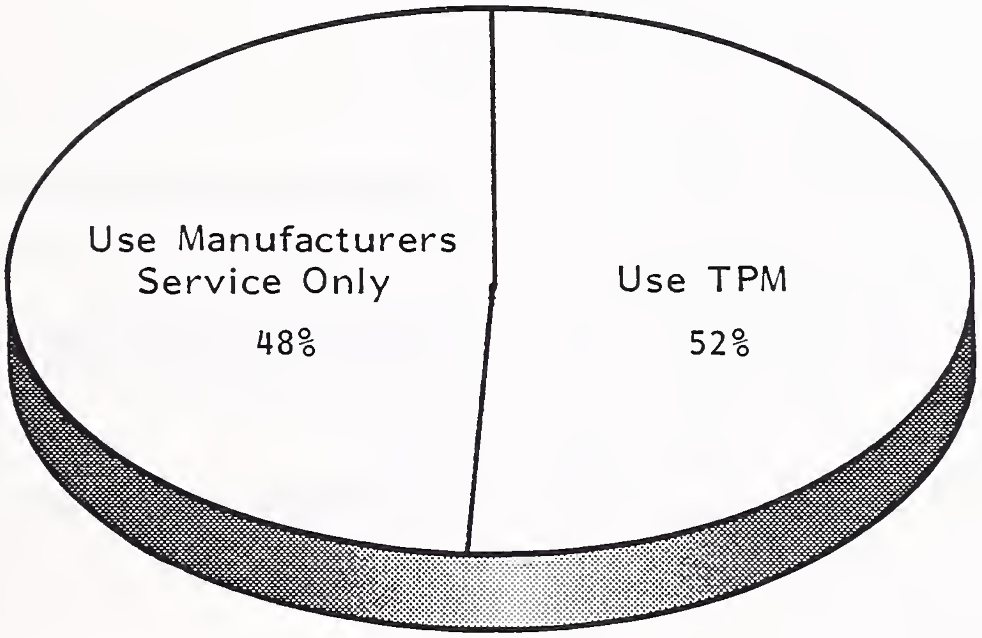
USER WILLINGNESS TO PERFORM MAINTENANCE
CDC



* Average Standard Error: 0.5

EXHIBIT III-D-12

CURRENT TPM USE
CDC



A greater percentage of CDC customers use TPM service (52%) than any other large system vendor. Suprisingly, only 23% with contracted TPM service use CDC as a TPM vendor.

EXHIBIT III-D-13

USER REQUIREMENTS FOR EXTENDED SERVICES
CDC

SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT* Low High 1 2 3 4 5 6 7 8 9 10
Preventive Maintenance during Non-Prime Hours	80%	9.0
Under Two-Hour Response	68	8.8
Standby Coverage	60	8.3
Remote Diagnostics	56	8.1
Maintenance Management	36	8.4
Deferred Response	16	7.8

*Average Standard Error: 0.3

E. HONEYWELL

- Twenty Honeywell DPS 8 users were interviewed by telephone in February 1986. The average interview lasted approximately 20 minutes and 85% of the respondents were data processing or operations managers. The survey was evenly distributed geographically and by industry. The industries represented in the sample include: government (20% of respondents), business services (20%), manufacturing (20%), and medical, transportation, insurance, and education (10% each).

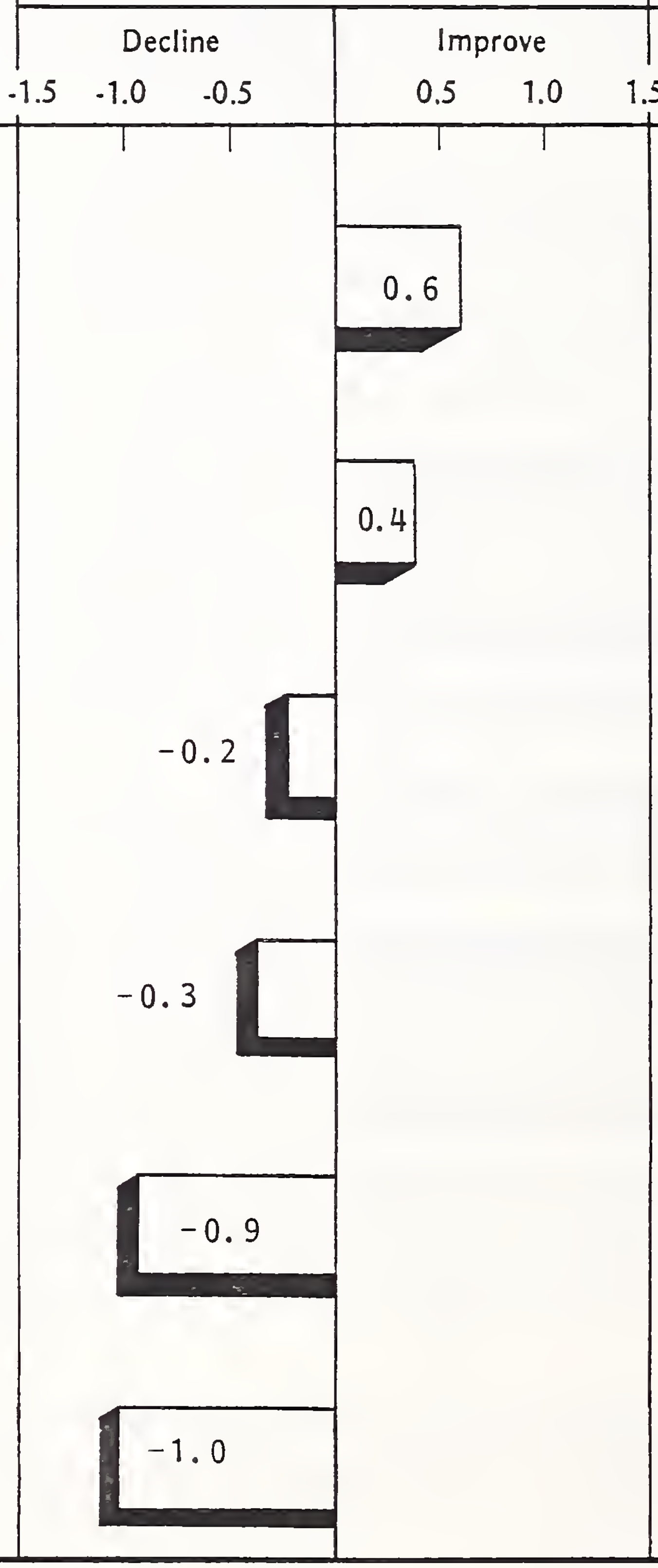
- Honeywell large systems users reported improved hardware service in the area of parts availability but a decline in service performance in hardware documentation and training, as shown in Exhibit III-E-1. Although users acknowledge both declines and improvements in service, expectations for all hardware services continue to increase uniformly. As Exhibit III-E-2 demonstrates, Honeywell is not meeting user expectations in five out of the top seven hardware support categories. The variance between user expectations and the level of service delivered by the vendor is greatest in two of the most important hardware service areas--parts availability and engineer skill level.

- Although user expectations for hardware services are not being met in some key areas, user satisfaction has increased from 1985 to 1986. Exhibit III-E-3 shows that in the last year satisfaction has increased in every area except parts availability and satisfaction with hardware documentation has improved in spite of a lower level of service provided. Despite these improvements, overall satisfaction with hardware service remains quite low. Users are still not satisfied with the skill level of the field service staff and the availability of spare parts. Exhibit III-E-4 illustrates the variance between user expectations for service and the levels of service actually delivered.

- Although user evaluations of Honeywell's hardware service performance have been mixed, Exhibit III-E-5 demonstrates that users noted a distinct improve-

EXHIBIT III-E-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
HONEYWELL



HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING* 1985	USER RATING* 1986†
Parts Availability	0.6	7.1	7.7
Service Overall	0.4	7.9	8.3
Engineer Skill Level	-0.2	7.9	7.7
Consulting	-0.3	6.9	6.6
Training	-0.9	7.1	6.2
Documentation	-1.0	6.9	5.9

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-E-2

1986 USER HARDWARE SERVICE RATINGS
HONEYWELL

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Parts Availability	9.3	7.7	(1.6)
Hardware Service Overall	8.9	8.3	(0.6)
Engineer Skill Level	8.8	7.7	(1.1)
Consulting	6.6	6.6	-
Training	6.6	6.2	(0.4)
Documentation	6.2	5.9	(0.3)
Remote Support	6.1	6.9	0.8

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error:

EXHIBIT III-E-3

USER SATISFACTION: HARDWARE SERVICES
HONEYWELL

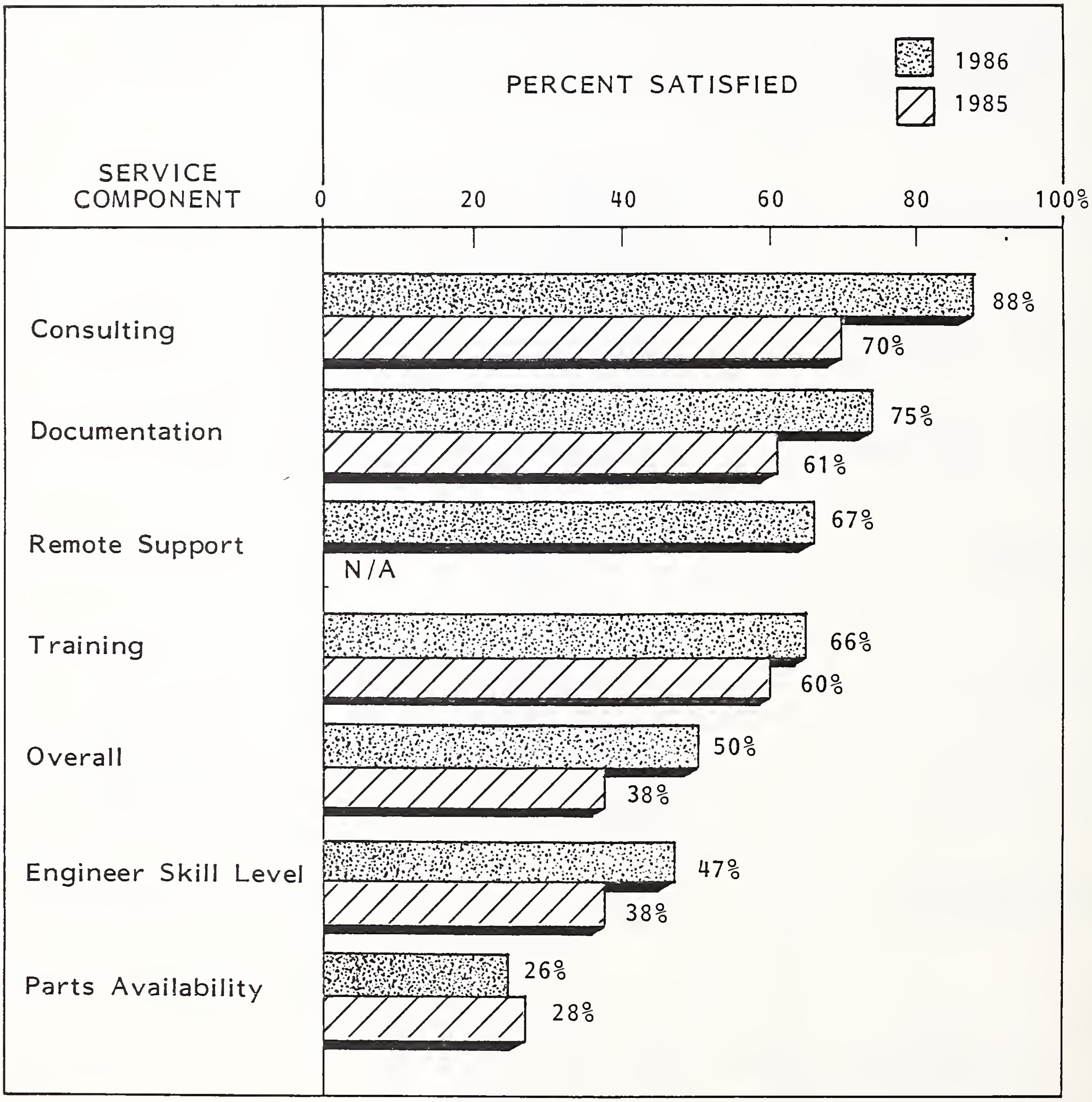
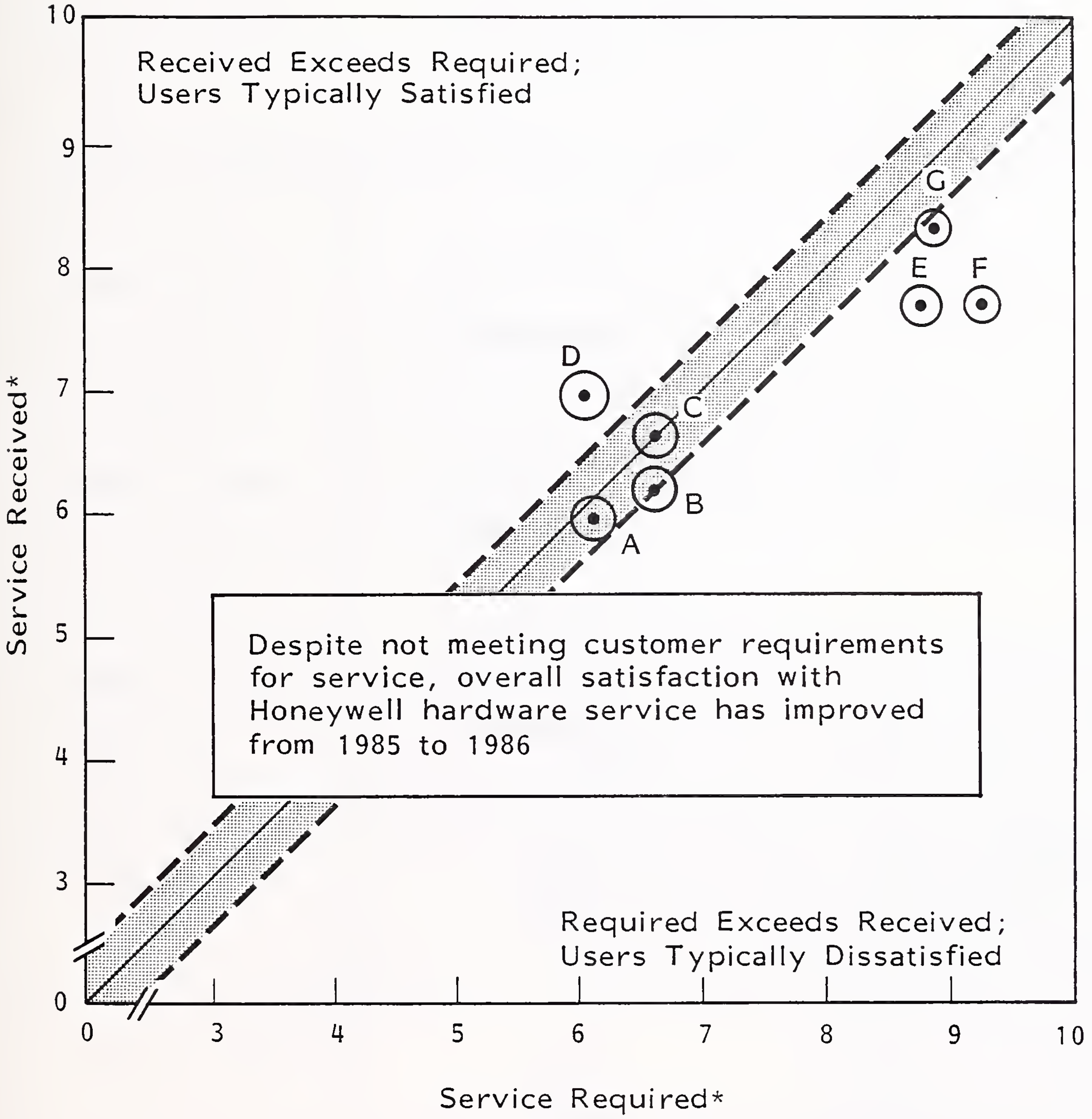


EXHIBIT III-E-4

HARDWARE SERVICES REQUIRED/RECEIVED
HONEYWELL



Despite not meeting customer requirements for service, overall satisfaction with Honeywell hardware service has improved from 1985 to 1986

A = Documentation
B = Training
C = Consulting
D = Remote Support

E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-E-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
HONEYWELL

SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE		USER RATING*	
	Decline -1.5 -1.0 -0.5	Improve 0.5 1.0 1.5	1985	1986†
Engineer Skill Level		1.0	7.4	8.4
Service Overall		0.9	7.3	8.2
Training		0.9	6.6	7.5
Documentation		0.5	6.7	7.2
Consulting		0.5	7.0	7.5

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

ment in systems software support from 1985 to 1986. But while the company has made substantial gains in systems software service, Exhibit III-E-6 shows that user expectations are still considerably higher than the level of service delivered by Honeywell. Expectations for systems software support have been growing rapidly for all large systems users over the last three to four years, and Honeywell is no exception. Areas of particular concern include systems software documentation, engineer skill level, and remote support.

- As a result of growing user expectations for service, improvements in systems software support have had only limited impact on user satisfaction. Exhibit III-E-7 indicates that user satisfaction with systems software support has improved marginally from 1985 to 1986, but that a majority of users are dissatisfied with most support categories. INPUT believes that systems software documentation and engineer skill level have an inordinately high influence on overall user satisfaction with systems software support. The company must improve service in these areas. Exhibit III-E-8 demonstrates that in order to improve service the company must address user expectations and perceptions of service.

- The user perception of service is frequently at odds with the actual level of service delivered. Exhibit III-E-9 demonstrates that Honeywell's actual service performance has improved, and in some areas the improvements have been quite dramatic. Average hardware response time, for example, improved by 33% between 1985 and 1986. And although Honeywell exceeded user expectations for service in several areas (see Exhibit III-E-10), INPUT believes that it is other service areas that have impacted satisfaction rather than traditional response/repair times. These areas include parts availability and engineer skill level.

- User dissatisfaction with the level of systems software service provided has led to a high level of acceptance and willingness to participate in systems software support. Exhibit III-E-11 demonstrates that Honeywell users are very willing to install software patches. In fact, Honeywell users are more

EXHIBIT III-E-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
HONEYWELL

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Service Overall	9.2	8.2	(1.0)
Engineer Skill Level	9.2	8.4	(0.8)
Documentation	8.6	7.2	(1.4)
Remote Support	8.3	7.6	(0.7)
Consulting	7.3	7.5	0.2
Training	7.2	7.5	0.3

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-E-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICES
HONEYWELL

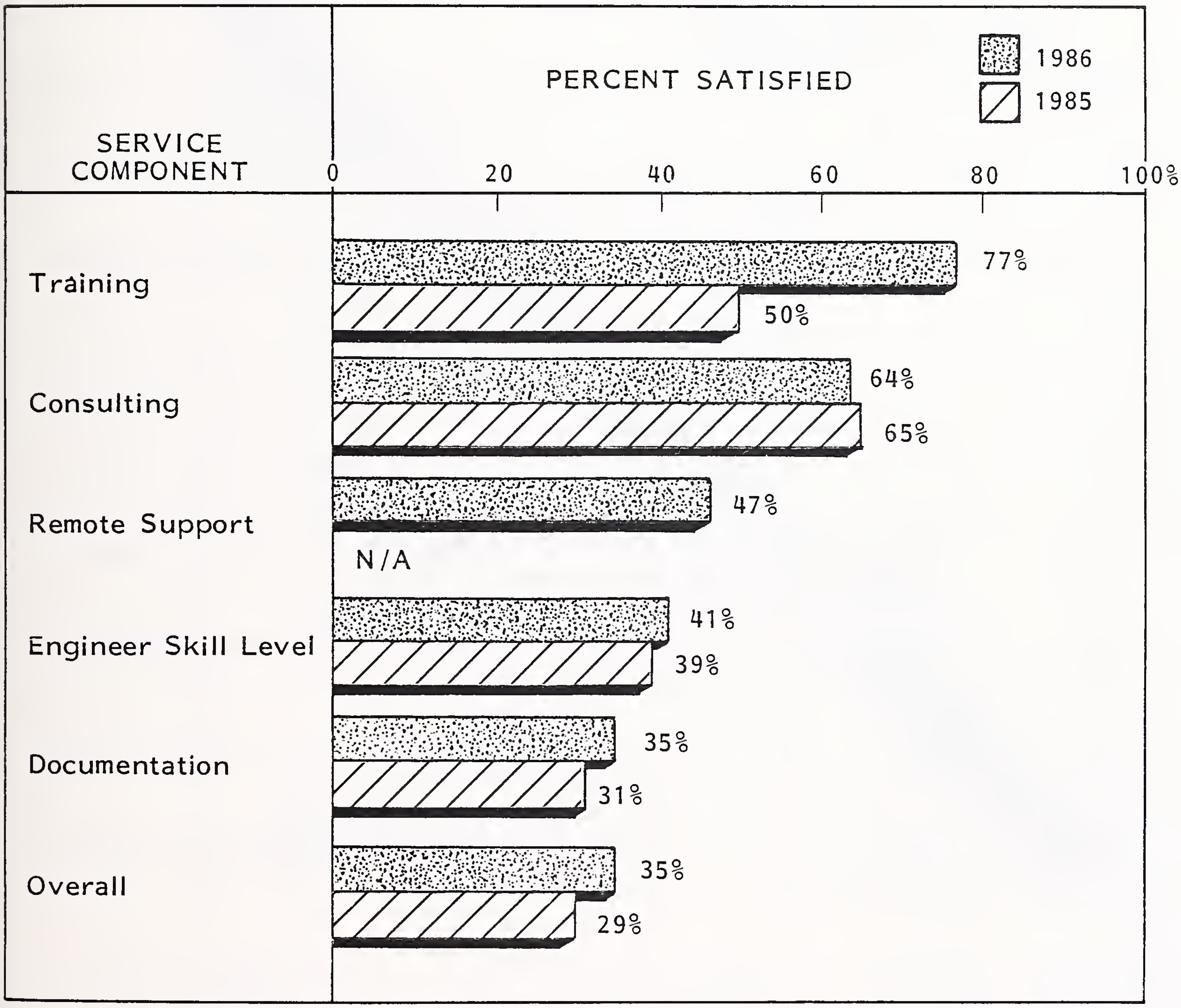
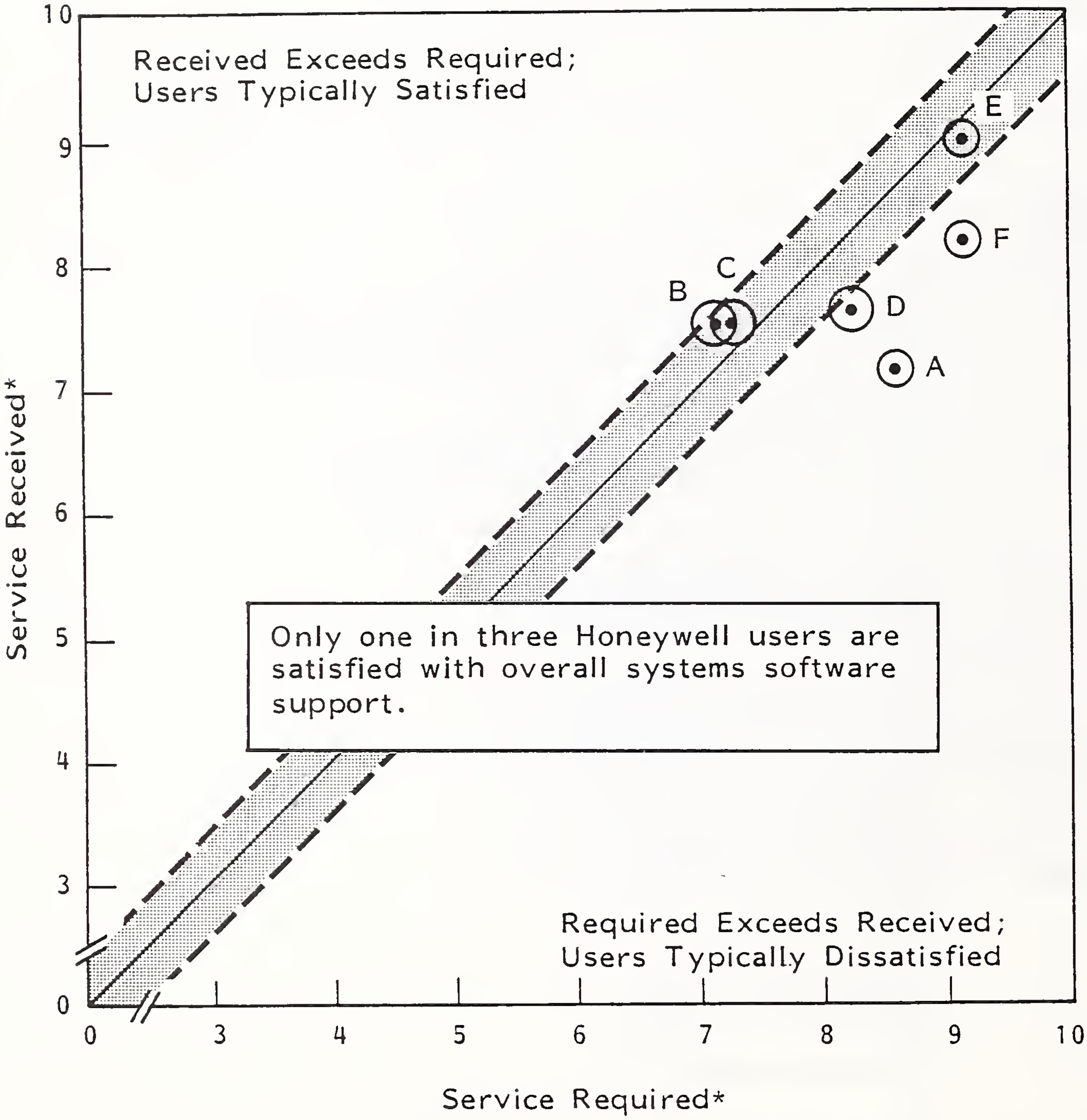


EXHIBIT III-E-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
HONEYWELL



A = Documentation
B = Training
C = Consulting

D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-E-9

SERVICE PERFORMANCE
HONEYWELL

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	97.2%	98.5%
Average Number of Interruptions		
Per Month (Number)	2.2	1.9
Percent Hardware Caused	62.0%	74.0%
Percent Software Caused	36.0%	26.0%
Average Hardware Response Time (Hours)	1.8 hr.	1.2 hr.
Average Hardware Repair Time (Hours)	2.1 hr.	1.8 hr.
Average Systems Software Response Time (Hours)	3.7 hr.	3.4 hr.
Average Systems Software Repair Time (Hours)	7.0 hr.	17.2 hr.

EXHIBIT III-E-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE
HONEYWELL

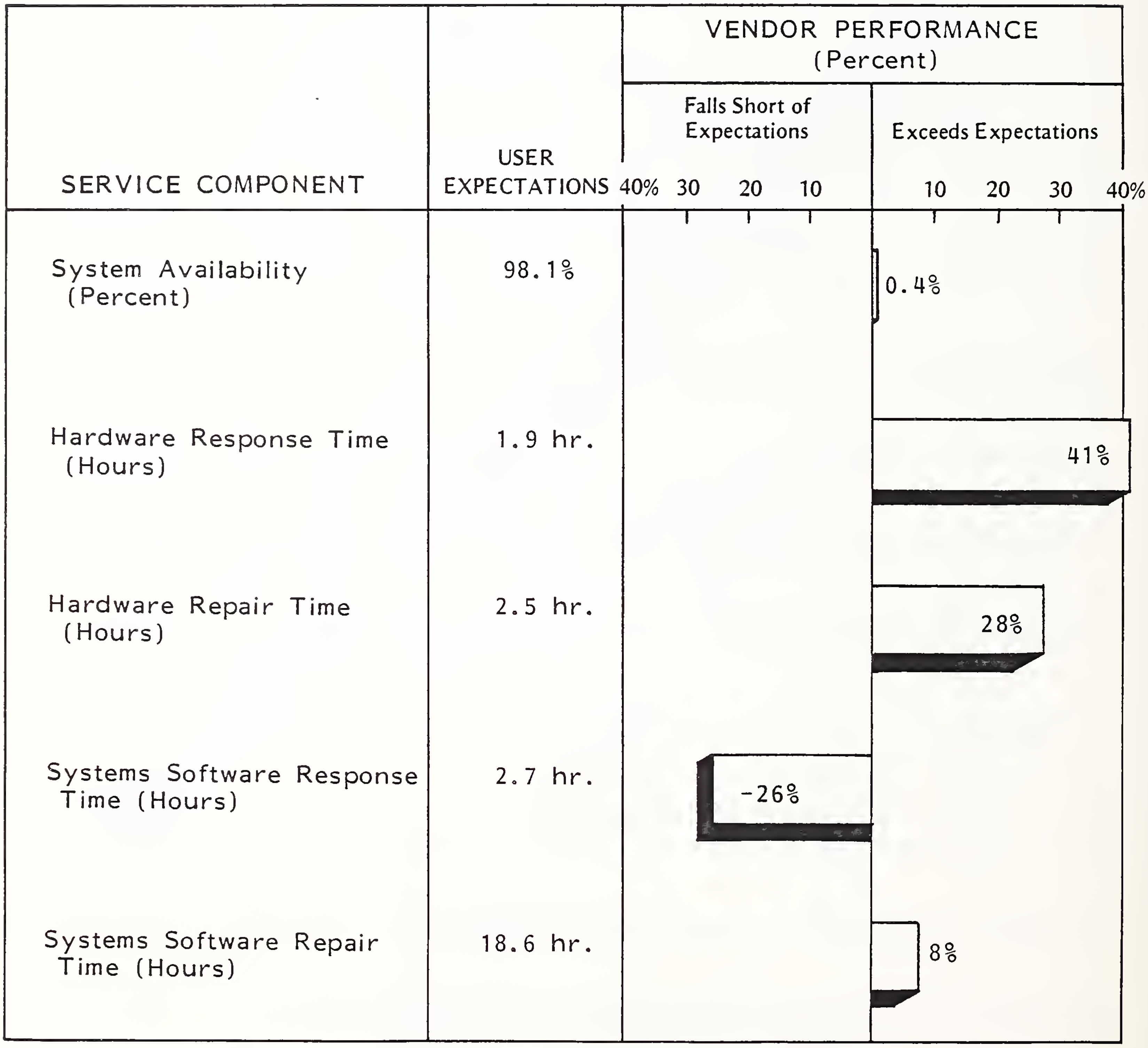
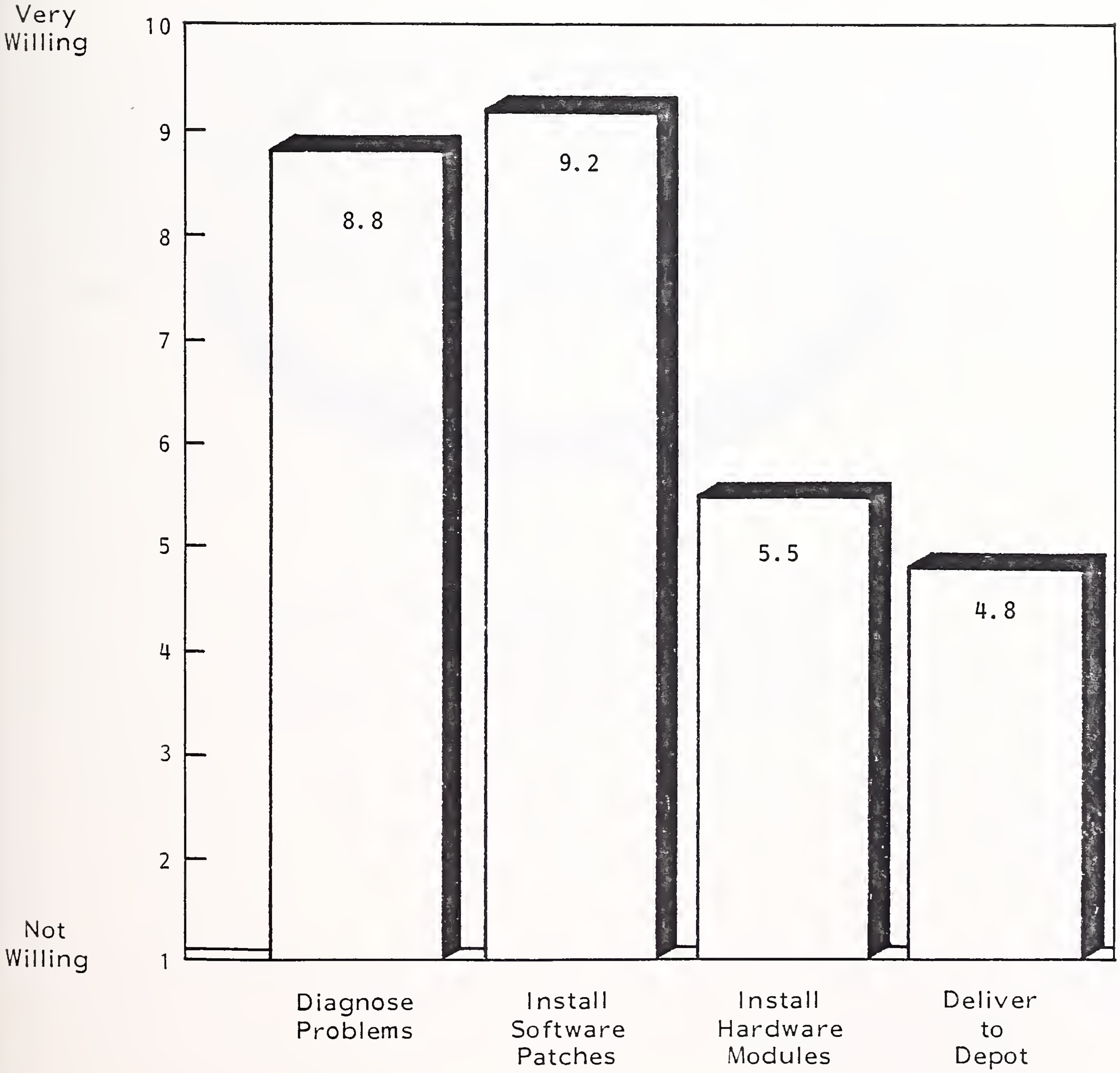


EXHIBIT III-E-11

USER WILLINGNESS TO PERFORM MAINTENANCE
HONEYWELL



* Average Standard Error: 0.6

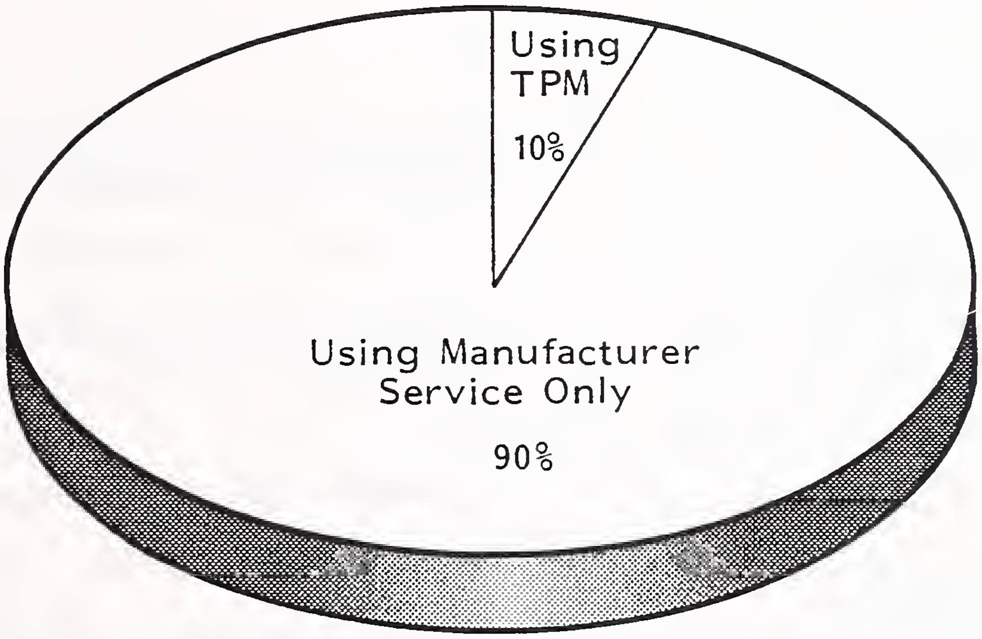
willing than any other group of large systems users to become involved in software support. INPUT believes that this willingness will continue to increase as long as customer satisfaction with Honeywell-delivered software service continues at the current low levels.

- Although Honeywell has become a major third-party maintenance vendor in the last few years, Exhibit III-E-12 demonstrates that few Honeywell users have TPM contracts. None of the Honeywell respondents are currently using Honeywell third-party maintenance, although INPUT expects that this will be a natural growth market for the company.

- Exhibit III-E-13 lists Honeywell user requirements for extended services. As with many of the large systems user groups, Honeywell users have a very high requirement for standby coverage and PM during non-prime hours. A much higher than average number of Honeywell users, however, require maintenance management contracts. This provides an excellent opportunity for Honeywell to integrate third-party maintenance services into their current service product groups.

EXHIBIT III-E-12

CURRENT TPM USE
HONEYWELL



Honeywell has the lowest TPM usage of all large system manufacturers. (None of the respondents use Honeywell TPM service.)

EXHIBIT III-E-13

USER REQUIREMENTS FOR EXTENDED SERVICES
HONEYWELL

SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT* Low 1 2 3 4 5 6 7 8 9 10 High
Standby Coverage	90%	8.6
Preventive Maintenance during Non-Prime Hours	65	8.8
Remote Diagnostics	65	7.9
Maintenance Management	60	8.4
Under Two-Hour Response	50	8.7
Deferred Response	25	6.6

*Average Standard Error: 0.3

III F. SPERRY

- In February 1986, INPUT interviewed 20 Sperry mainframe users (1100 systems) regarding the level of services received and required. All interviews were conducted by telephone and, on average, lasted 20 minutes. While the interviews were dispersed geographically, there is a heavy concentration of respondents in manufacturing (30% of all interviews), government (20%), and business services (15%). Other industries included education, medical, and retail distribution.

- Exhibit III-F-1 demonstrates the users' perception that hardware service has declined between 1985 and 1986. Statistically significant declines in service were reported in important service areas, such as engineer skill level and the user perception of overall hardware service. While the decline in parts availability from 1985 to 1986 was negligible, Exhibit III-F-2 indicates that user expectations for service in this area are very high and are currently not being met. The variance between the users' requirements for service and the level of service delivered increased with the perceived importance of the service. This is just the opposite of what vendors would be expected to prefer because of the negative impact this variance will have on user satisfaction.

- Sperry user satisfaction with hardware service, as shown in Exhibit III-F-3, is improving, but satisfaction levels remain quite low. The exhibit demonstrates that Sperry has made impressive gains in areas such as documentation and consulting and that satisfaction has declined in only one category--training. Still, a majority of users are dissatisfied with the most important services (i.e., those with a high level of user requirement), including parts availability and engineer skill level. Exhibit III-F-4 graphically illustrates the variance in user requirements for service versus the level of service delivered by Sperry.

- While user ratings of Sperry hardware performance clearly declined from 1985 to 1986, systems software performance has improved, as shown in Exhibit

EXHIBIT III-F-1

HARDWARE SERVICE PERFORMANCE, 1986-1986
SPERRY

HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE Decline -1.5 -1.0 -0.5 / Improve 0.5 1.0 1.5	USER RATING* 1985	USER RATING* 1986†
Parts Availability	-0.1	6.9	6.8
Consulting	-0.1	7.4	7.3
Documentation	-0.5	7.0	6.5
Service Overall	-0.7	8.2	7.5
Engineer Skill Level	-0.7	8.3	7.6
Training	-0.9	6.9	6.0

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-F-2

1986 USER HARDWARE SERVICE RATINGS
SPERRY

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Parts Availability	8.8	6.8	(2.0)
Engineer Skill Level	8.7	7.6	(1.1)
Hardware Service Overall	8.6	7.5	(1.1)
Documentation	7.2	6.5	(0.7)
Consulting	6.6	7.3	0.7
Training	6.4	6.0	(0.4)
Remote Support	6.4	6.9	0.5

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-F-3

USER SATISFACTION: HARDWARE SERVICES
SPERRY

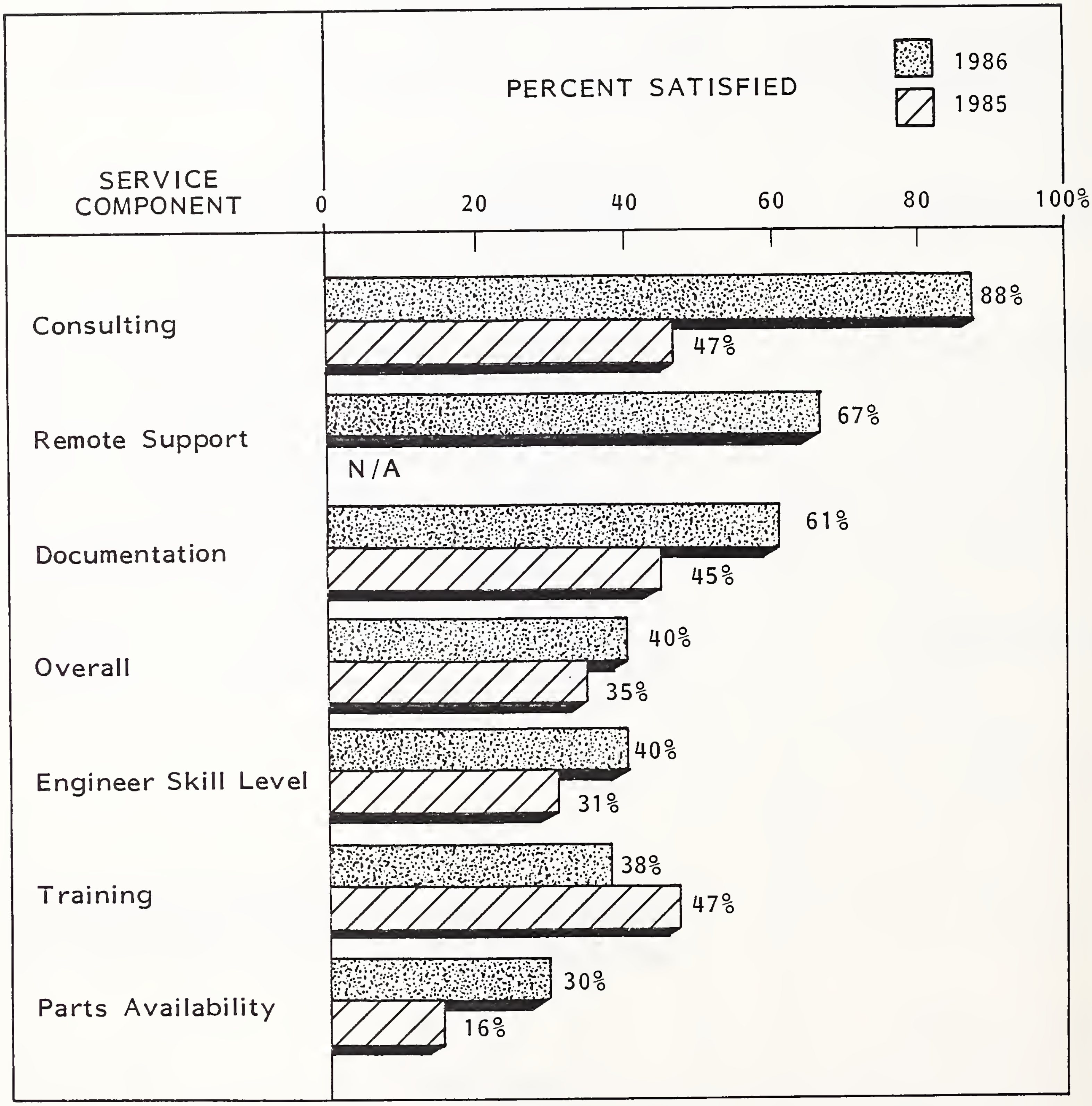
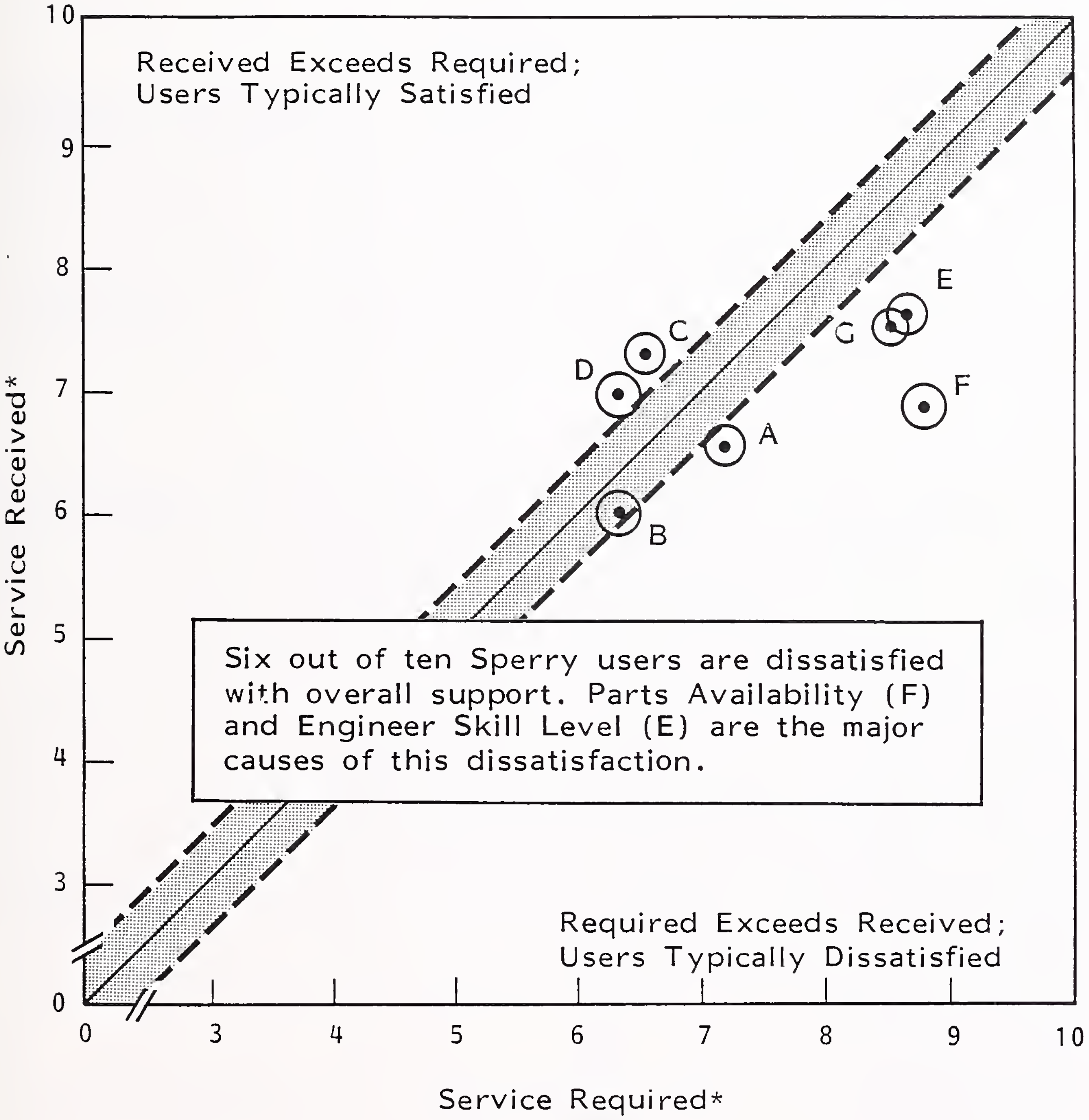


EXHIBIT III-F-4

HARDWARE SERVICES REQUIRED/RECEIVED
SPERRY



Six out of ten Sperry users are dissatisfied with overall support. Parts Availability (F) and Engineer Skill Level (E) are the major causes of this dissatisfaction.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

III-F-5. Substantial gains were made in both training and consulting. However, as demonstrated in Exhibit III-F-6, even with improvements in software support, user requirements for systems software service are still not being met. A major problem area for Sperry is in systems software documentation. Users complain that experienced staff cannot find the information they need in the documentation and that it is not effective to use training programs for inexperienced personnel.

- It is not surprising that overall user satisfaction with Sperry's systems software support is low considering the fact that the level of service required by the customers is so much higher than the level of service delivered. Exhibit III-F-7 demonstrates that a majority of users are dissatisfied with every systems support category. Despite some changes in the overall level of service, there is no statistically significant change in the users' satisfaction rating from 1985 to 1986.

- Exhibit III-F-8 emphasizes the fact that customer satisfaction is directly tied to the vendor's ability to meet or exceed user expectations for service. There is a wide variance between Sperry user expectations and the services delivered, and this has a severe negative impact for customer satisfaction.

- As with many of the vendors covered in this report, Sperry's performance is much better than one would assume from the user satisfaction results. Exhibit III-F-9 shows that the company's average systems availability on the 1100 systems has actually improved from 1985 to 1986. In addition, average systems software response and repair time has improved by a total of 29%. However, as Exhibit III-F-10 demonstrates, user expectations for service improvements greatly exceed vendor performance in these areas. For example, although Sperry improved systems software response time by 46% (9.1 hours to 4.1 hours), users expected a two-hour response time. A similar pattern exists for both hardware and systems software repair time.

EXHIBIT III-F-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
SPERRY

SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE (Decline -1.5 -1.0 -0.5 / Improve 0.5 1.0 1.5)	USER RATING*	
		1985	1986†
Training	0.7	6.0	6.7
Consulting	0.5	6.5	7.0
Service Overall	0.2	6.5	6.7
Engineer Skill Level	0.1	7.3	7.4
Documentation	-0.1	6.5	6.4

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-F-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
SPERRY

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Consulting	7.5	7.0	(0.5)
Remote Support	7.7	6.9	(0.8)
Training	7.5	6.7	(0.8)
Engineer Skill Level	8.5	7.4	(1.1)
Service Overall	8.1	6.7	(1.4)
Documentation	8.4	6.4	(0.2)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-F-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICES
SPERRY

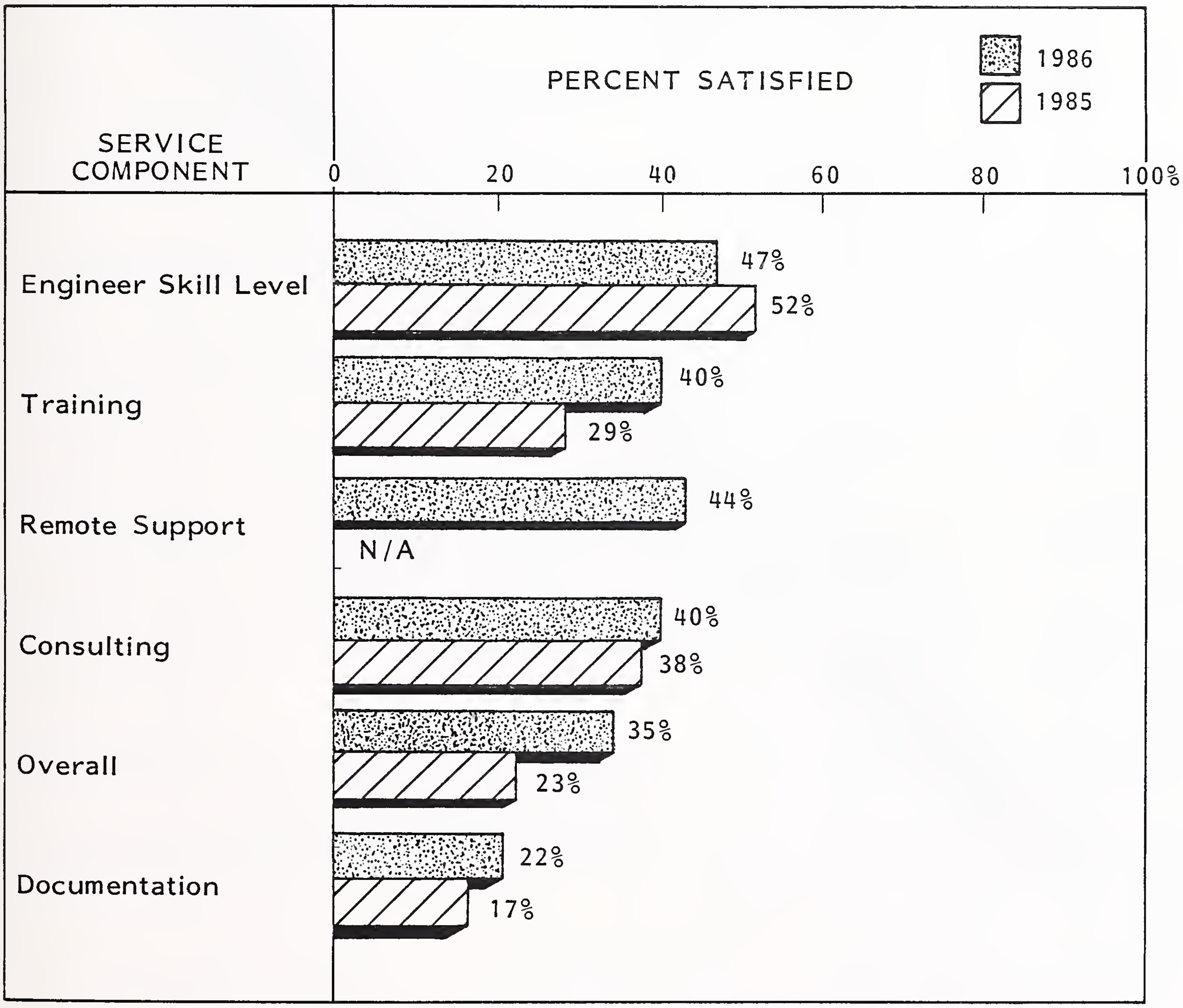
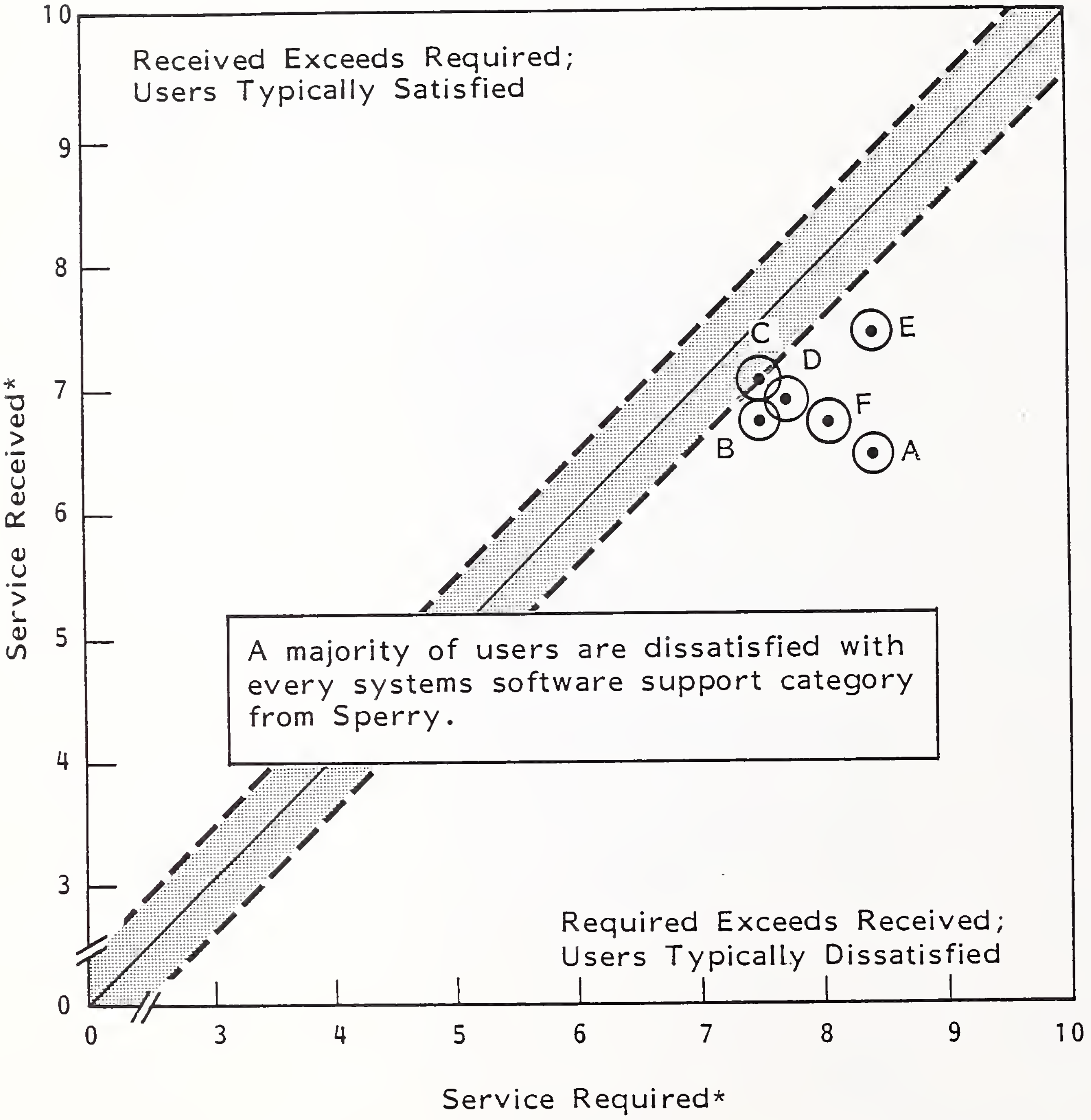


EXHIBIT III-F-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
SPERRY



A majority of users are dissatisfied with every systems software support category from Sperry.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-F-9

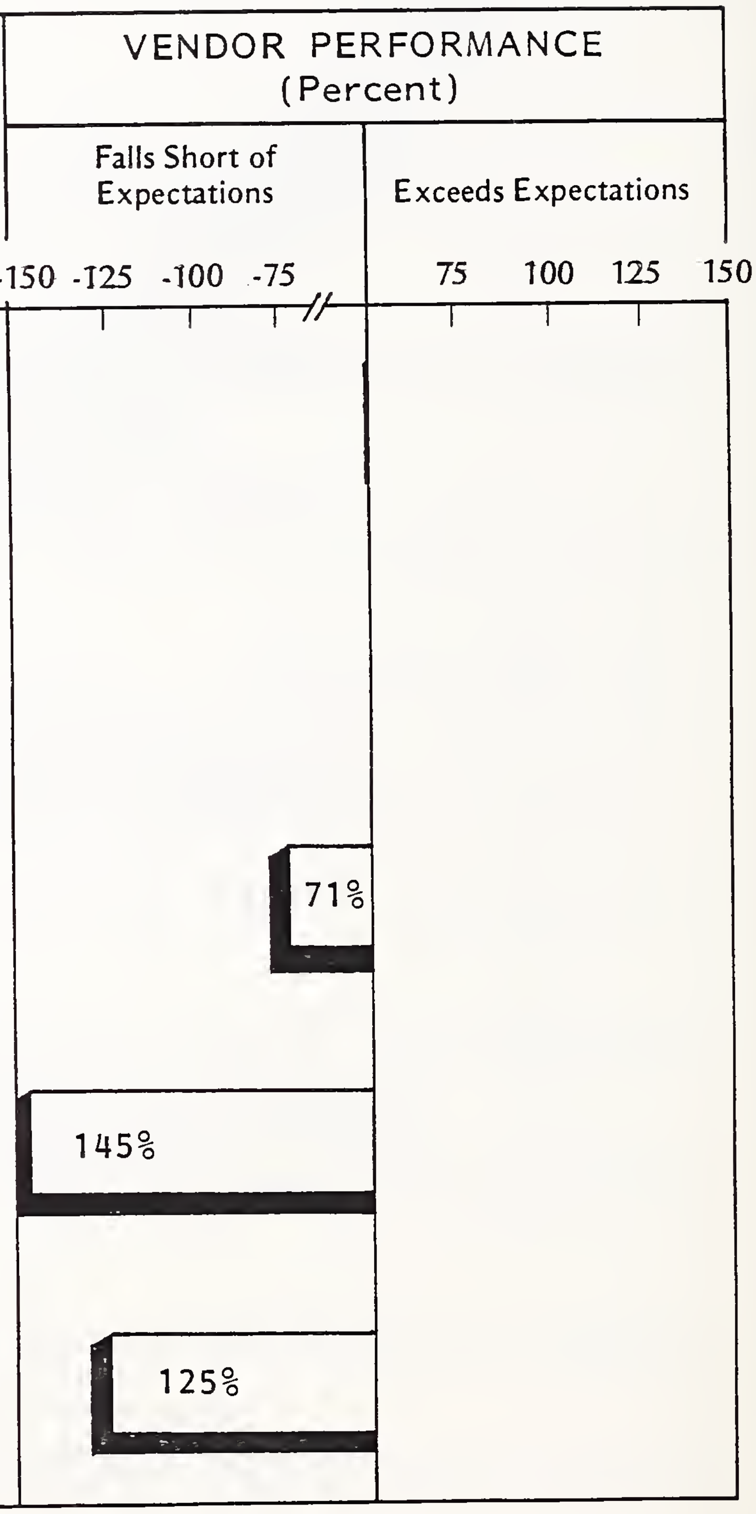
SERVICE PERFORMANCE
SPERRY

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	96.9%	97.8%
Average Number of Interruptions		
Per Month (Number)	2.2	3.0
Percent Hardware Caused	60.0%	62.0%
Percent Software Caused	26.0%	30.0%
Average Hardware Response Time (Hours)	0.6 hr.	0.9 hr.
Average Hardware Repair Time (Hours)	1.6 hr.	4.1 hr.
Average Systems Software Response Time (Hours)	9.1 hr.	4.9 hr.
Average Systems Software Repair Time (Hours)	47.0 hr.	34.8 hr.

EXHIBIT III-F-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE
SPERRY

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent) Falls Short of Expectations	VENDOR PERFORMANCE (Percent) Exceeds Expectations
System Availability (Percent)	98.3%		
Hardware Response Time (Hours)	0.9 hr.		
Hardware Repair Time (Hours)	2.4 hr.	71%	
Systems Software Response Time (Hours)	2.0 hr.	145%	
Systems Software Repair Time (Hours)	15.5 hr.	125%	

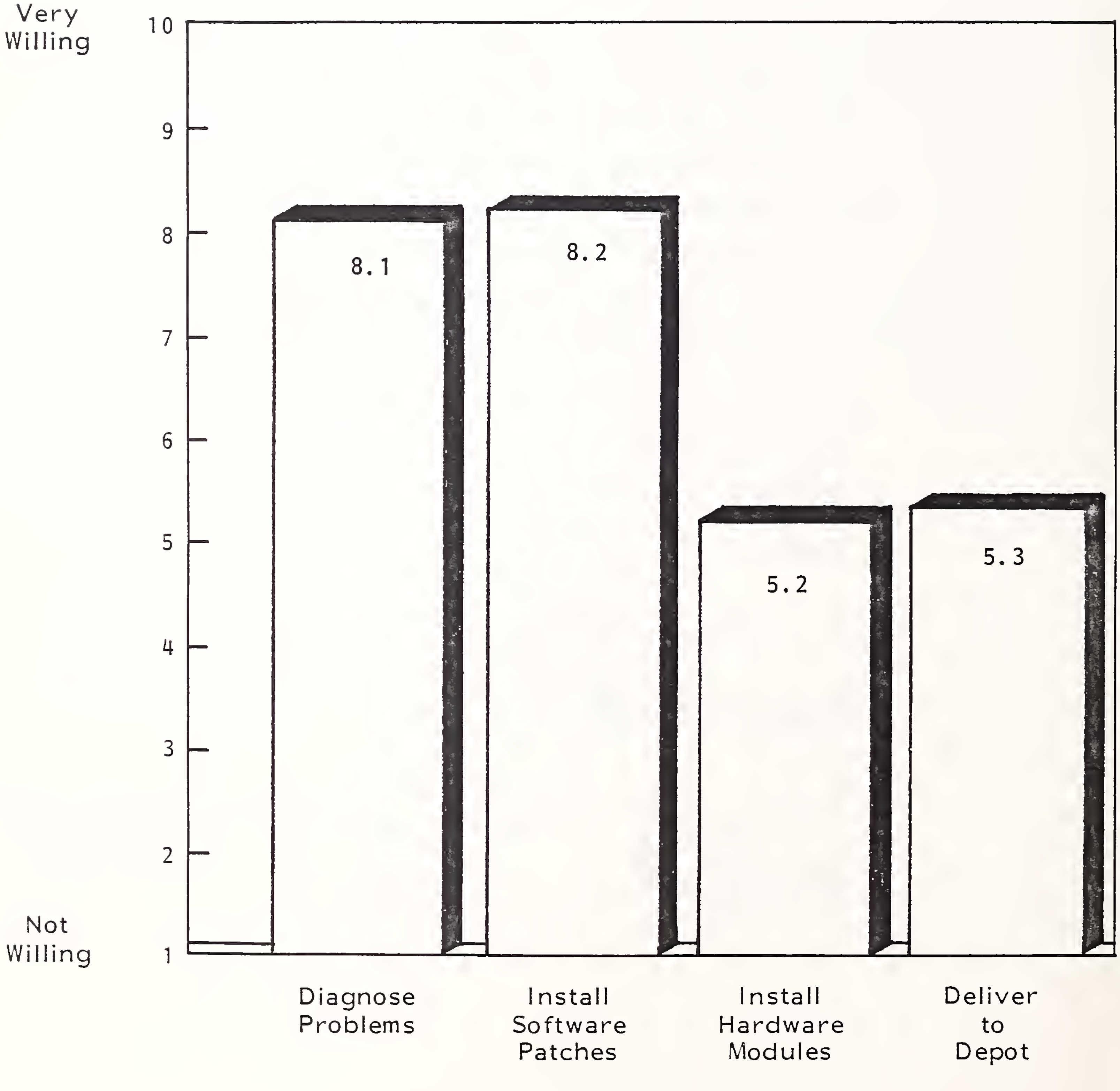


- Some large systems user groups react to a lower than expected level of service by becoming more involved in support and establishing internal service capabilities. This is not the case among most Sperry users. When compared to other large systems vendors, Exhibit III-F-11 demonstrates that Sperry users have an average to lower than average willingness to become involved in service and support. Considering the level of software support available from Sperry, INPUT expected user willingness in this area to be in the 9.4 to 9.6 region rather than 8.2. Sperry users are, however, very dependent on manufacturer support, and this is a definite opportunity for the company.

- Use of third-party maintenance at sites with a Sperry CPU (see Exhibit III-F-12) stayed constant from 1985 (23%) to 1986 (25%). Similar to Honeywell, none of the Sperry users that did have TPM contracts used Sperry TPM service. Considering the loyalty Sperry users have for that manufacturer's support, it appears that this would be an excellent opportunity area. Exhibit III-F-13 demonstrates a reasonably high requirement for maintenance management contracts and this may also be an opportunity area for Sperry, particularly if the company continues to expand its third-party maintenance products.

EXHIBIT III-F-11

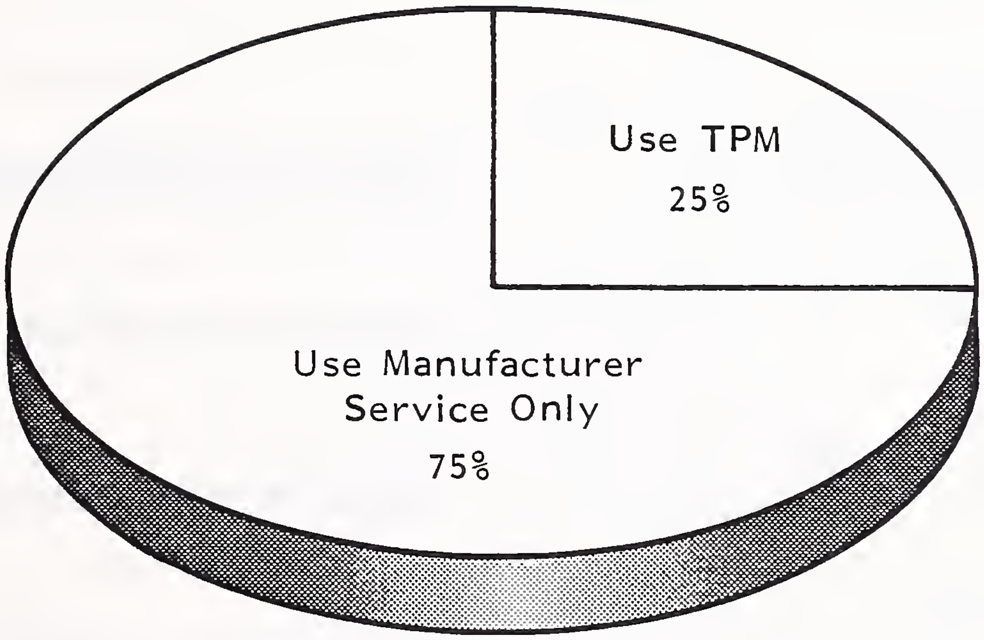
USER WILLINGNESS TO PERFORM MAINTENANCE
SPERRY



* Average Standard Error: 0.5

EXHIBIT III-F-12

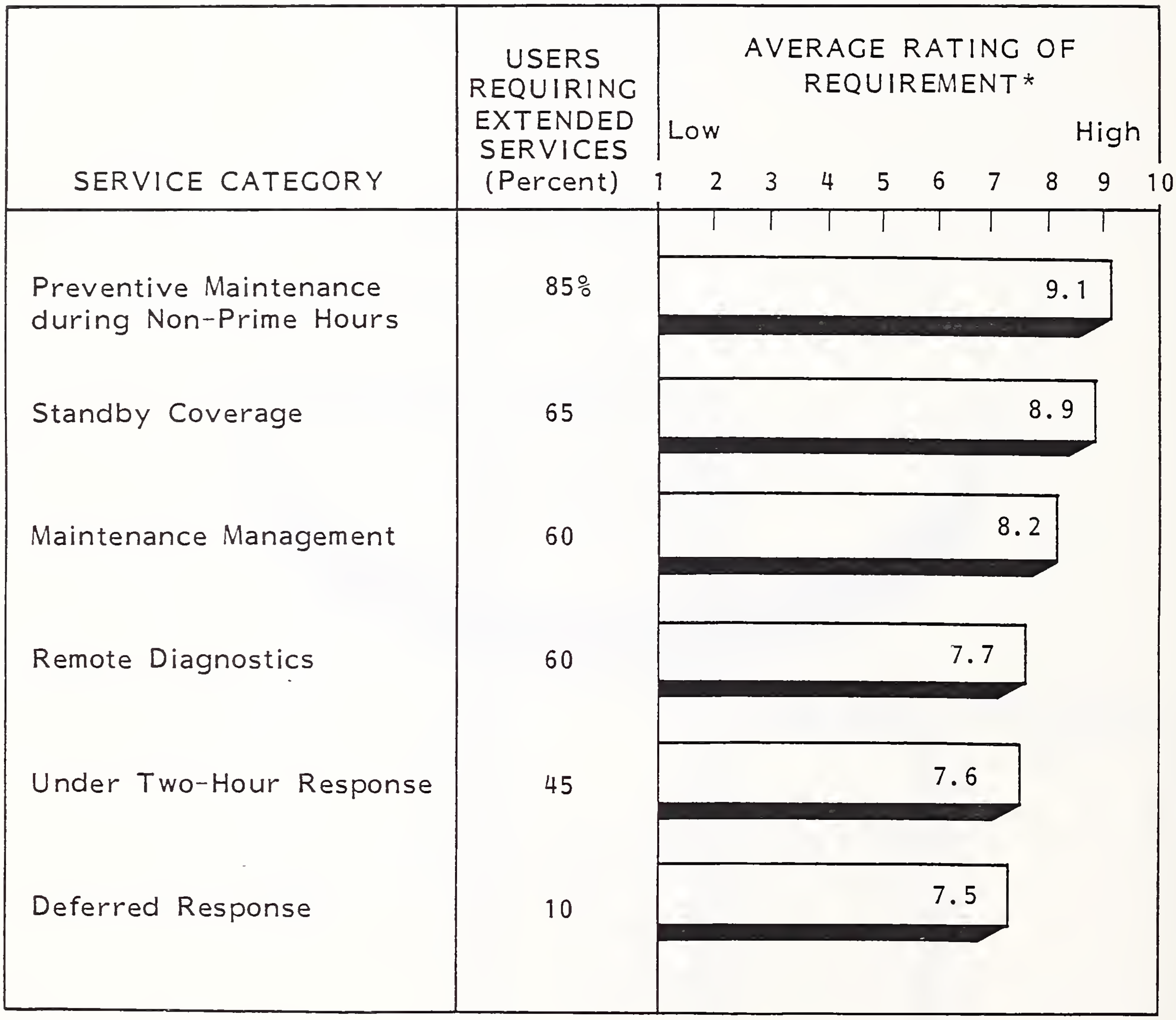
CURRENT TPM USE
SPERRY



25% of Sperry users have at least one TPM contract at their DP site. None of the user interviewed had contracts with Sperry for third-party maintenance.

EXHIBIT III-F-13

USER REQUIREMENTS FOR EXTENDED SERVICES
SPERRY



SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT*
Preventive Maintenance during Non-Prime Hours	85%	9.1
Standby Coverage	65	8.9
Maintenance Management	60	8.2
Remote Diagnostics	60	7.7
Under Two-Hour Response	45	7.6
Deferred Response	10	7.5

*Average Standard Error: 0.3

G. NCR

- Twenty-five NCR large systems (8500) users were interviewed in 1986, compared to 30 users in 1985. The interviews were conducted by telephone in February and March 1986 and each interview took an average of 20 minutes. Overall, the survey was dispersed geographically, although the industry breakdown is weighted toward manufacturing (32%), banking (24%), and medical and business services (each 16%). Over 80% of the interviews were conducted with data processing or operations managers.

- NCR's hardware service performance from 1985 to 1986 is shown in Exhibit III-G-1. Overall, when including the effect of the statistical error, users have indicated that hardware service has not changed dramatically from 1985 to 1986. In the area of documentation, however, users noted a relatively significant decline in the company's performance.

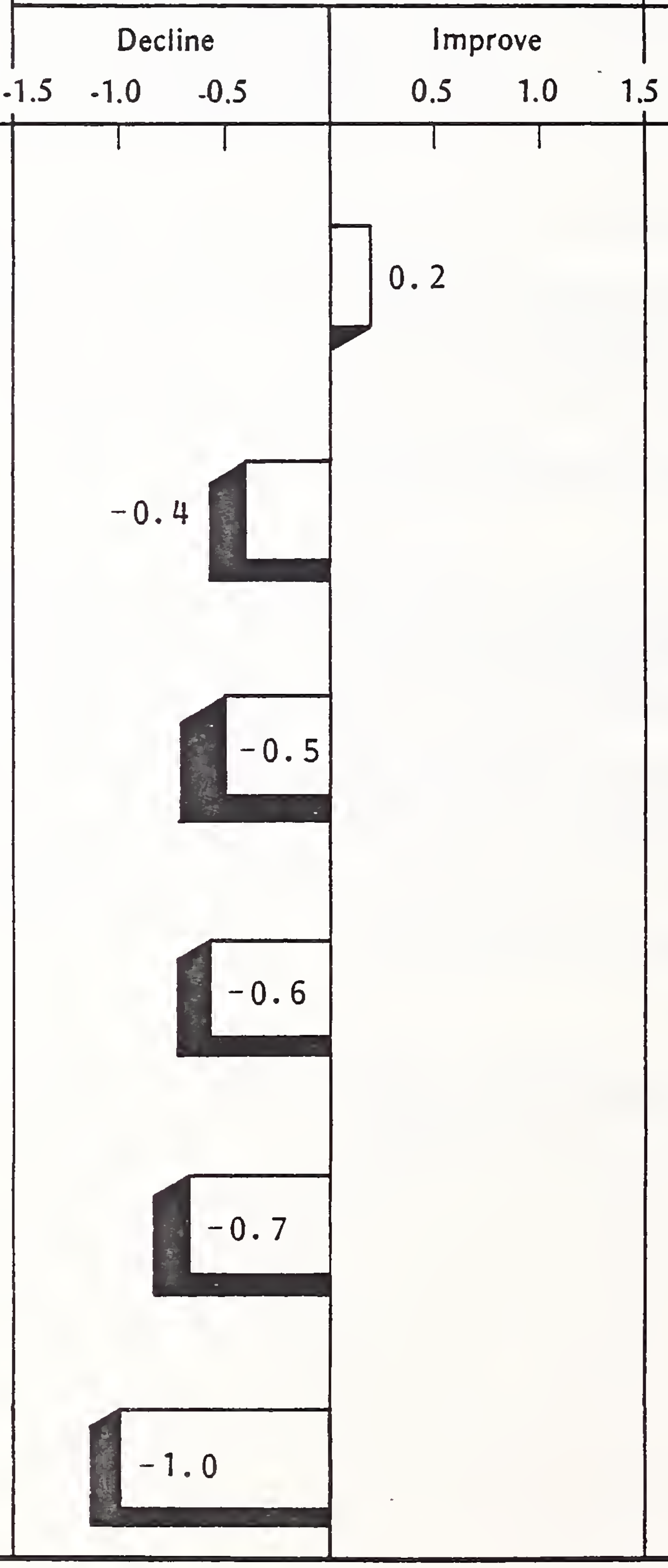
- Although the perceived level of service delivered has not changed, Exhibit III-G-2 demonstrates that NCR user requirements for service are quite high and that the company does not meet user expectations for service in five out of the top seven categories. Again, the statistical error can account for a number of variations in the level of service required versus received, but in the area of parts availability NCR has clearly fallen short of user expectations.

- Exhibit III-G-3 demonstrates that a majority of large system NCR users are satisfied with all NCR hardware services except one--parts availability. Although the company has improved satisfaction in a number of important areas such as engineer skill level, consulting, and training, overall satisfaction with hardware support has declined to just 29% primarily as a result of very high levels of customer dissatisfaction with parts and parts availability. Exhibit III-G-4 illustrates graphically the importance of just one or two high-requirement services on the customer's perception of total service.

EXHIBIT III-G-1

HARDWARE SERVICE PERFORMANCE, 1985-1986

NCR



HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING*	
		1985	1986†
Engineer Skill Level	0.2	7.9	8.1
Consulting	-0.4	6.6	6.2
Parts Availability	-0.5	6.6	6.1
Training	-0.6	6.6	6.0
Service Overall	-0.7	7.8	7.1
Documentation	-1.0	7.4	6.4

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-G-2

1986 USER HARDWARE SERVICE RATINGS

NCR

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE* Required†	LEVEL OF SERVICE* Received†	SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
Engineer Skill Level	8.8	8.1	(0.7)
Parts Availability	8.7	6.1	(2.6)
Hardware Service Overall	7.8	7.1	(0.7)
Documentation	6.6	6.4	(0.2)
Consulting	6.2	6.2	-
Training	6.0	6.0	-
Remote Support	4.4	4.3	(0.1)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-G-3

USER SATISFACTION: HARDWARE SERVICE
NCR

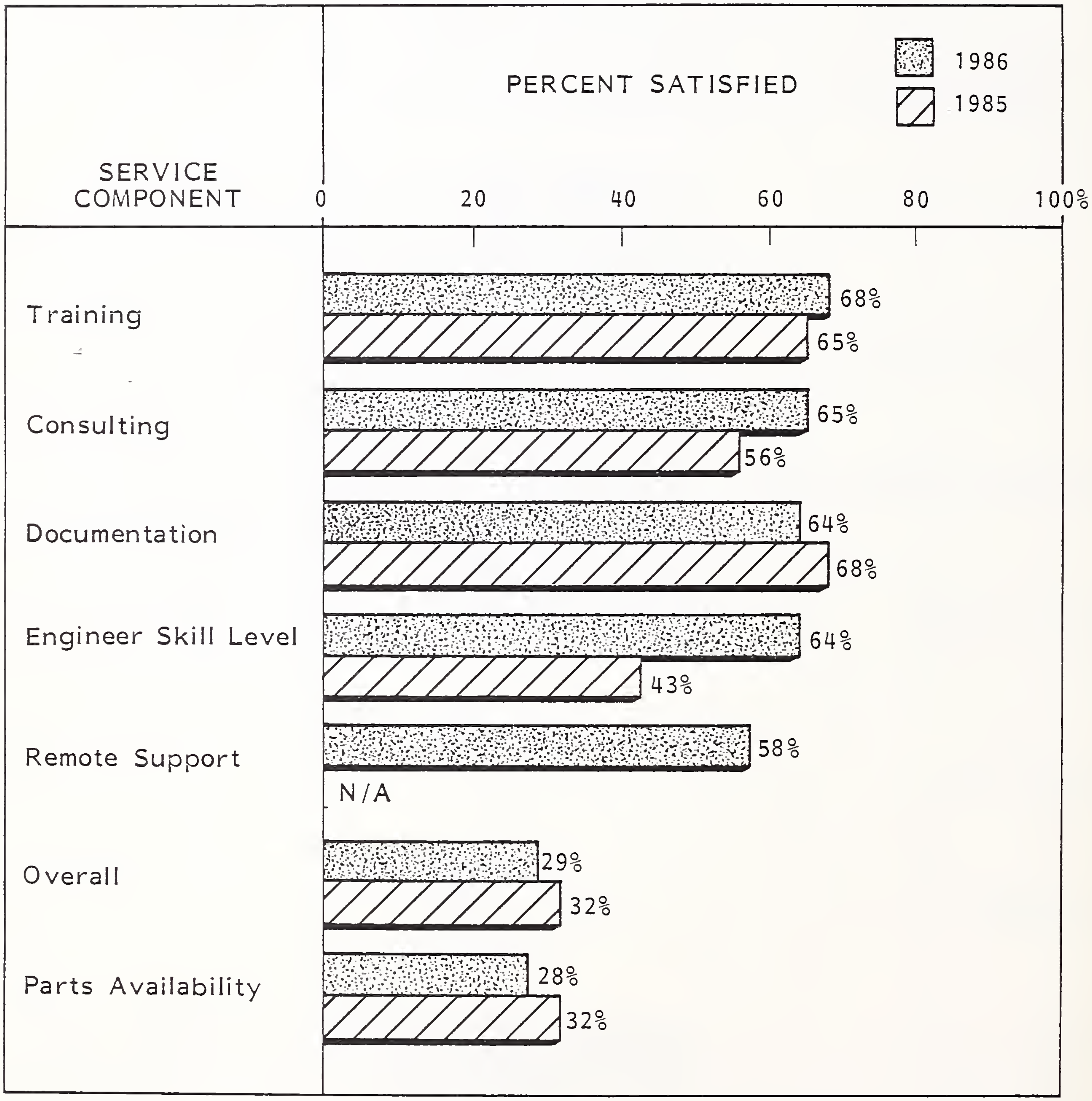
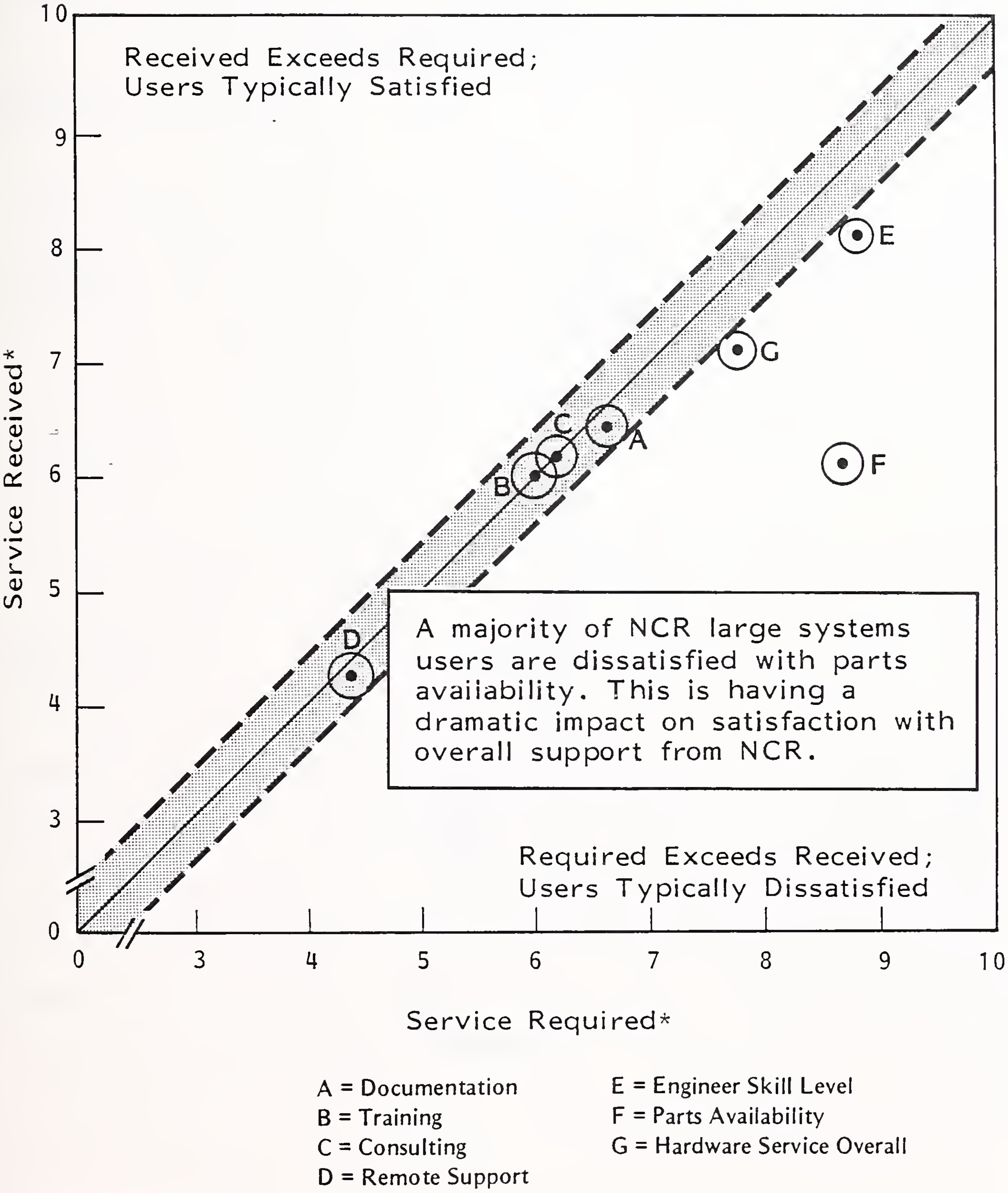


EXHIBIT III-G-4

HARDWARE SERVICES REQUIRED/RECEIVED
NCR



A majority of NCR large systems users are dissatisfied with parts availability. This is having a dramatic impact on satisfaction with overall support from NCR.

* Rating: 1 = Low, 10 = High

- Systems software service from NCR exhibits a similar pattern to hardware service in terms of performance from 1985 to 1986. Exhibit III-G-5 shows that some areas improved marginally and some declined, but only one area (consulting) declined beyond the standard error. This does not mean that NCR user requirements are being met. Exhibit III-G-6 demonstrates that user requirements for service are not being met in any of the six key systems software support categories. Although these requirements for systems software support are not being met, customer satisfaction in this area is quite high (see Exhibit III-G-7).

- One very significant gain in user satisfaction is in the area of systems software documentation. Although NCR performance in documentation is substantially below user expectations (7.8 required versus 6.9 delivered), satisfaction increased from 37% in 1985 to 52% in 1986. INPUT believes that this improvement has been instrumental in maintaining customer satisfaction with NCR systems software support.

- Exhibit III-G-8 graphically demonstrates the impact of the user service requirement and the level of service received on customer satisfaction.

- As with a number of other user groups, NCR users' perception of service sometimes is at variance with the level of service actually delivered. For example, Exhibit III-G-9 shows improved systems availability, fewer interruptions, and a better hardware and software response/repair time. Some of the improvements were quite substantial: number of interruptions per month fell by 47%, hardware repair time declined by 37%, and systems software repair time was reduced by 34%. Despite these improvements, customer expectations for service are so high that it is difficult for the manufacturer to deliver the level of service required. Exhibit III-G-10 demonstrates that vendor performance falls short of user expectations by 30% to over 100% in critical support categories.

EXHIBIT III-G-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
NCR

SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE Decline -1.5 -1.0 -0.5 / Improve 0.5 1.0 1.5	USER RATING*	
		1985	1986†
Training	0.5	6.2	6.7
Engineer Skill Level	0 0	7.0	7.0
Documentation	-0.1	7.0	6.9
Service Overall	-0.6	7.0	6.4
Consulting	-0.7	6.4	5.7

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-G-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
NCR

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Remote Support	▨ 6.4	▨ 6.3	▨ (0.1)
Training	6.3	6.7	0.4
Service Overall	▨ 7.0	▨ 6.4	▨ (0.6)
Engineer Skill Level	▨ 7.6	▨ 7.0	▨ (0.6)
Consulting	▨ 6.4	▨ 5.7	▨ (0.7)
Documentation	▨ 7.8	▨ 6.9	▨ (0.9)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-G-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
NCR

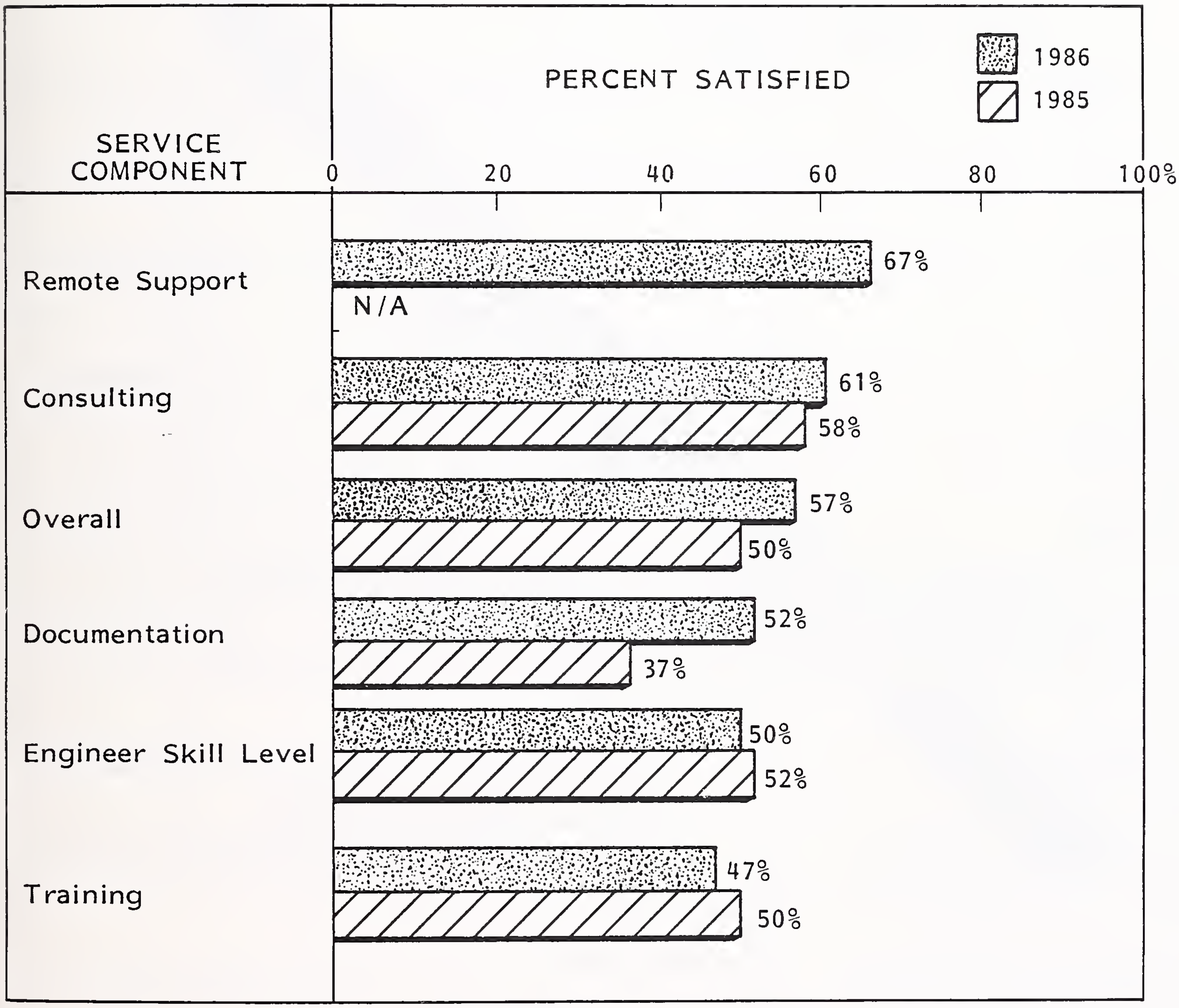
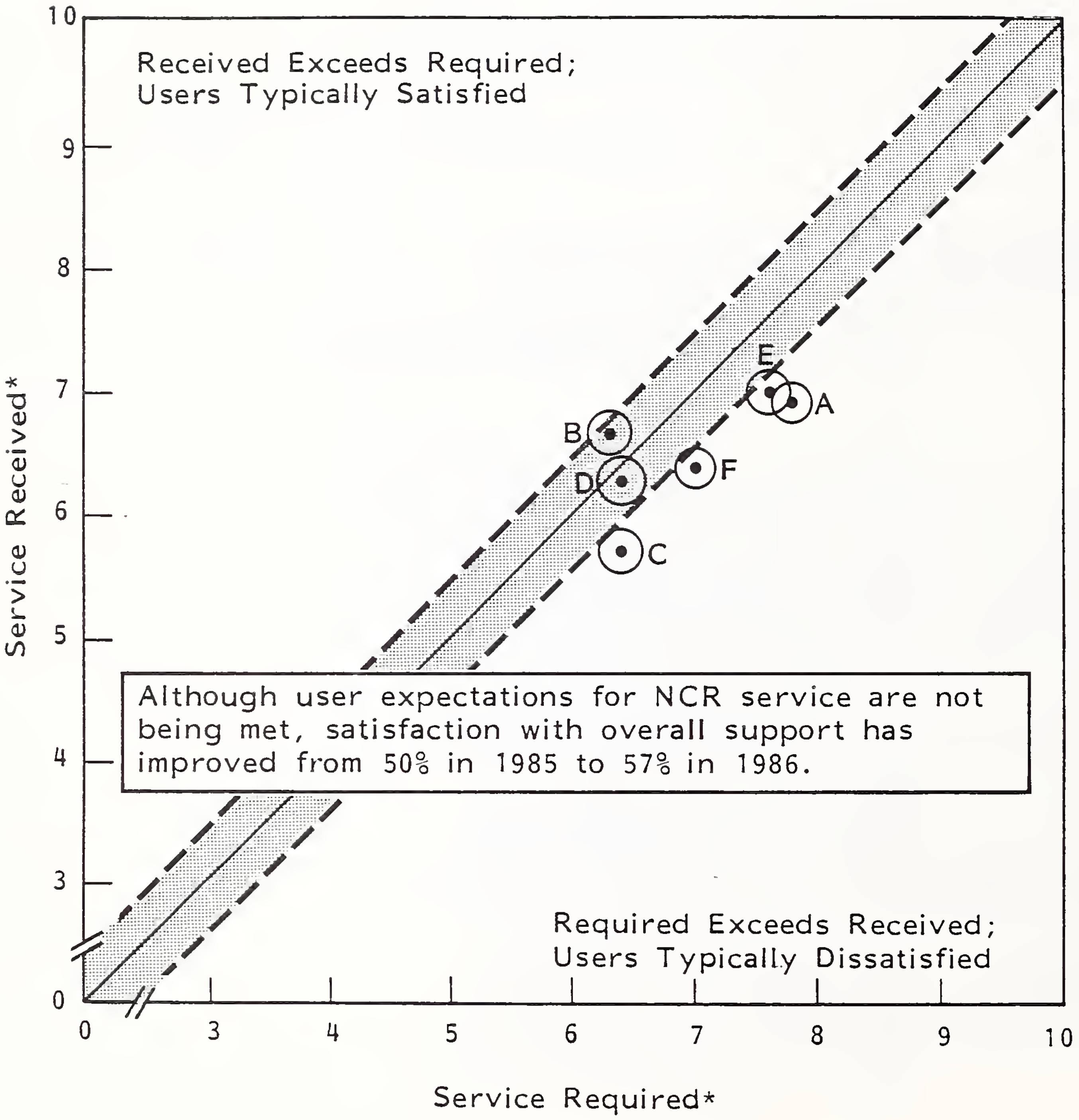


EXHIBIT III-G-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
NCR



Although user expectations for NCR service are not being met, satisfaction with overall support has improved from 50% in 1985 to 57% in 1986.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-G-9

SERVICE PERFORMANCE
NCR

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	97.2%	97.5%
Average Number of Interruptions		
Per Month (Number)	3.0	1.6
Percent Hardware Caused	62.0%	77.0%
Percent Software Caused	21.0%	23.0%
Average Hardware Response Time (Hours)	1.7 hr.	1.5 hr.
Average Hardware Repair Time (Hours)	2.7 hr	1.7 hr.
Average Systems Software Response Time (Hours)	3.9 hr.	2.2 hr.
Average Systems Software Repair Time (Hours)	26.9%	17.8%

EXHIBIT III-G-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE
NCR

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent)	
		Falls Short of Expectations 100% 75 50 25	Exceeds Expectations 25 50 75 100%
System Availability (Percent)	98.3%		0.1%
Hardware Response Time (Hours)	2.5 hr.		40%
Hardware Repair Time (Hours)	1.3 hr.	-31%	
Systems Software Response Time (Hours)	1.3 hr.	-69%	
Systems Software Repair Time (Hours)	3.0 hr.	>100%	

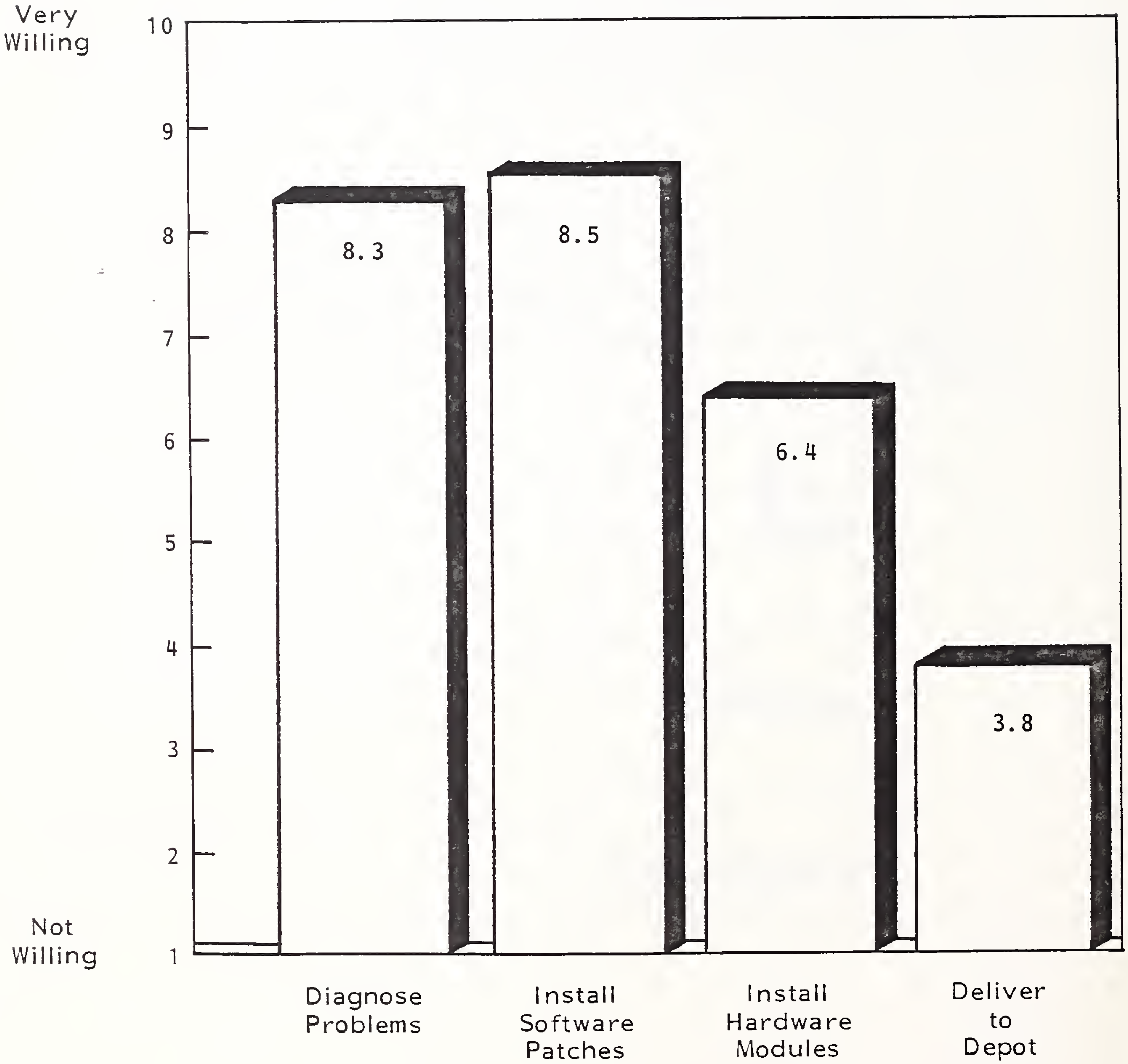
- Because of their high requirement for service, particularly in the area of systems software service, NCR large systems users are somewhat more willing to explore alternative service options than other user groups. Exhibit III-G-11, for example, demonstrates that NCR users are quite willing to participate in some forms of maintenance. In comparison, other users are reluctant to participate in software support, ranking their willingness to install software in the 6.8 (Burroughs) to 7.5 (IBM and Amdahl) range.

- As user expectations for service continues to grow, INPUT has expected a greater acceptance of TPM options by NCR users. However, as Exhibit III-G-12 indicates, use of third-party maintenance by NCR customers has actually declined in the last year. In addition, none of the users had TPM contracts with NCR.

- NCR users exhibited a lower than average requirement for extended services than most large systems users. Exhibit III-G-13 shows that the most popular extended service among NCR users is standby coverage. However, only 56% of users require this service versus up to 80% for some other large systems vendors.

EXHIBIT III-G-11

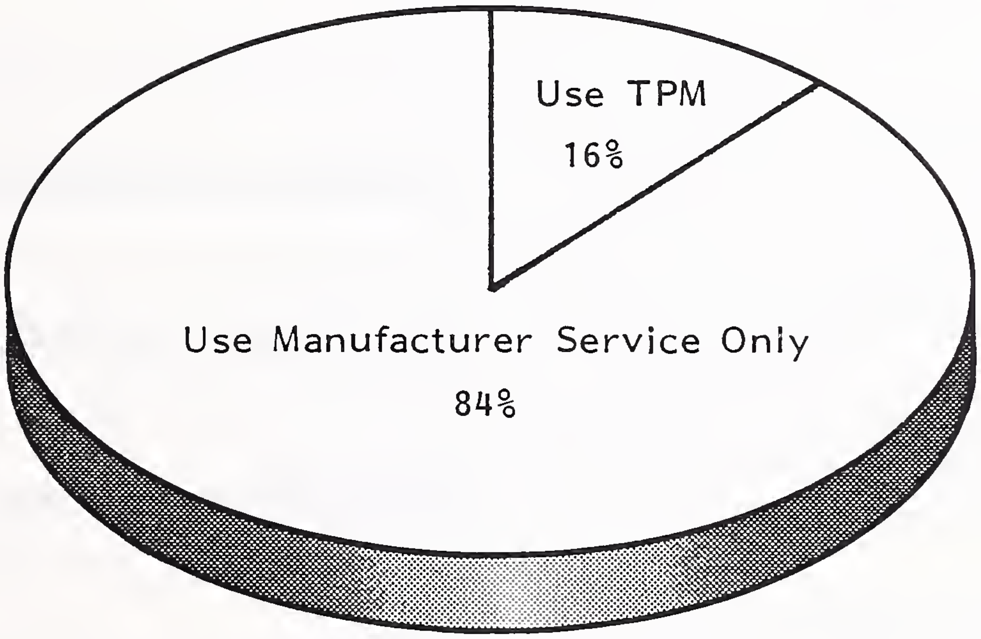
USER WILLINGNESS TO PERFORM MAINTENANCE
NCR



* Average Standard Error: 0.5

EXHIBIT III-G-12

CURRENT TPM USE
NCR



16% of NCR mainframe users have third-party maintenance on at least one piece of DP equipment at their sites. This is down from 20% in 1985.

EXHIBIT III-G-13

USER REQUIREMENTS FOR EXTENDED SERVICES
NCR

SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT* Low 1 2 3 4 5 6 7 8 9 10 High
Standby Coverage	56%	8.3
Maintenance Management	52	8.4
Preventive Maintenance during Non-Prime Hours	48	8.3
Under Two-Hour Response	40	9.6
Deferred Response	12	7.3
Remote Diagnostics	12	8.0

*Average Standard Error: 0.3

H. BURROUGHS

- A total of 20 Burroughs large systems (7800 and 7900) users were interviewed in February and March 1986 for this report. All interviews were conducted by telephone, with each interview lasting an average of 20 minutes. Approximately 70% of the respondents were operations or data processing managers. Interviews were evenly dispersed geographically. Breakdown by industry includes manufacturing (30% of respondents), business services (25%), government (15%), education (10%), and other (20%).

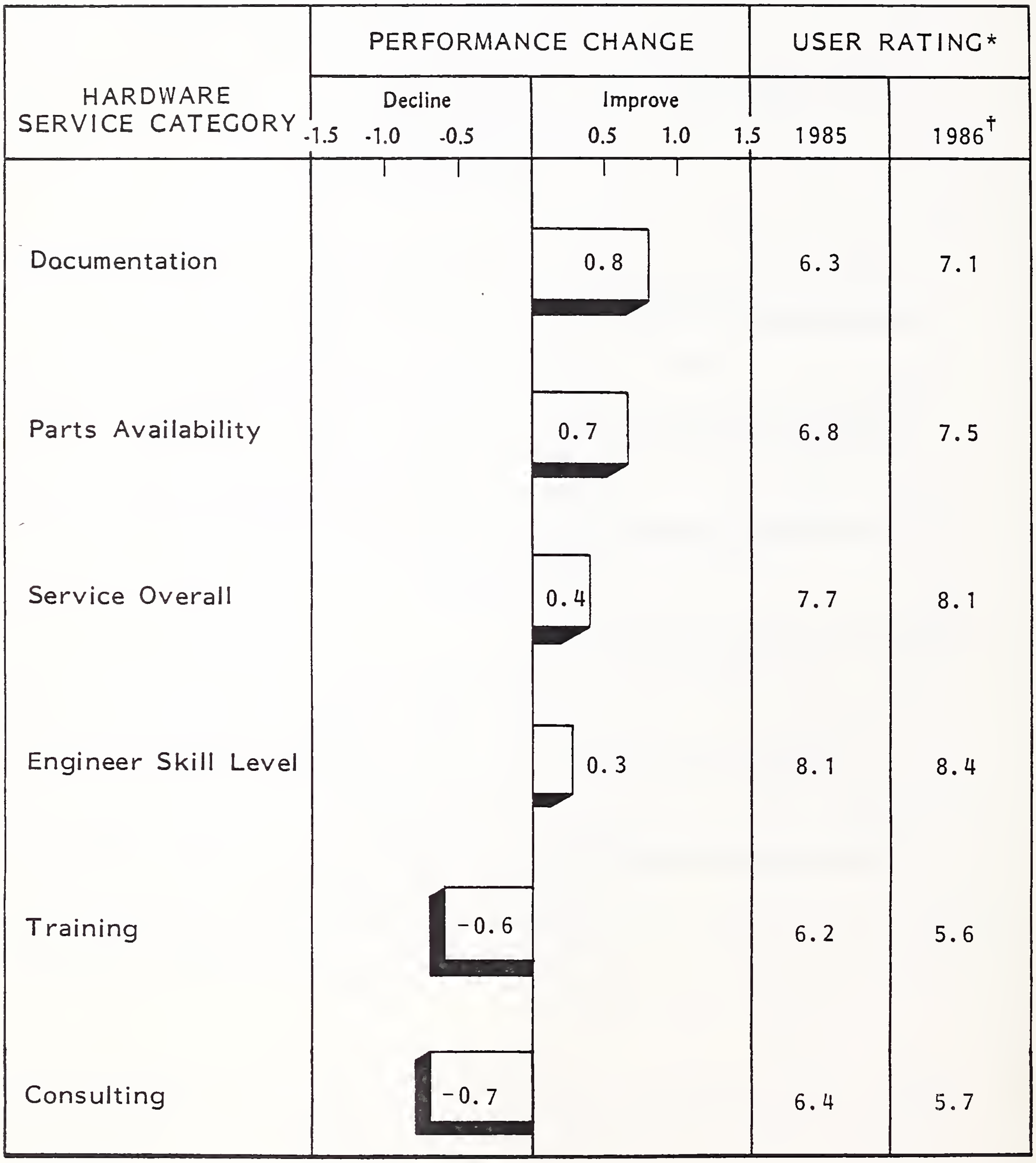
- Burroughs users indicated that hardware service has improved between 1985 and 1986, as shown in Exhibit III-H-1. Statistically significant improvements have been made in hardware documentation and parts availability. Users felt, however, that hardware training and consulting services actually declined between 1985 and 1986. Despite whatever gains were made, user requirements for service are not currently being met in most hardware support areas. Exhibit III-H-2 demonstrates that in only one area (remote support) does Burroughs exceed user needs for service. It is not surprising, therefore, that customer satisfaction has been impacted.

- Overall user satisfaction with hardware service (see Exhibit III-H-3) has declined from 49% in 1985 to 42% in 1986. Although user satisfaction with parts availability more than doubled in 1986 (to 58%), INPUT believes that the company's inability to meet user needs in this area has been instrumental in the decline in overall hardware service satisfaction. Consulting, although not a high-requirement service, has also impacted Burroughs user satisfaction. Users said that they were receiving much less consulting service than they required, particularly in a multi-vendor environment. As a result, overall user satisfaction fell by more than 10%.

- Exhibit III-H-4 graphically illustrates that most user requirements for hardware services are not being met by the manufacturer. Obviously, the

EXHIBIT III-H-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
BURROUGHS



HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING* 1985	USER RATING* 1986†
Documentation	0.8	6.3	7.1
Parts Availability	0.7	6.8	7.5
Service Overall	0.4	7.7	8.1
Engineer Skill Level	0.3	8.1	8.4
Training	-0.6	6.2	5.6
Consulting	-0.7	6.4	5.7

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-H-2

1986 USER HARDWARE SERVICE RATINGS
BURROUGHS

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Engineer Skill Level	9.2	8.4	(0.8)
Hardware Service Overall	9.1	8.1	(1.0)
Parts Availability	9.0	7.5	(1.5)
Documentation	7.8	7.1	(0.7)
Remote Support	6.7	6.9	0.2
Consulting	6.6	5.7	(0.9)
Training	5.5	5.6	0.1

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-H-3

USER SATISFACTION: HARDWARE SERVICE BURROUGHS

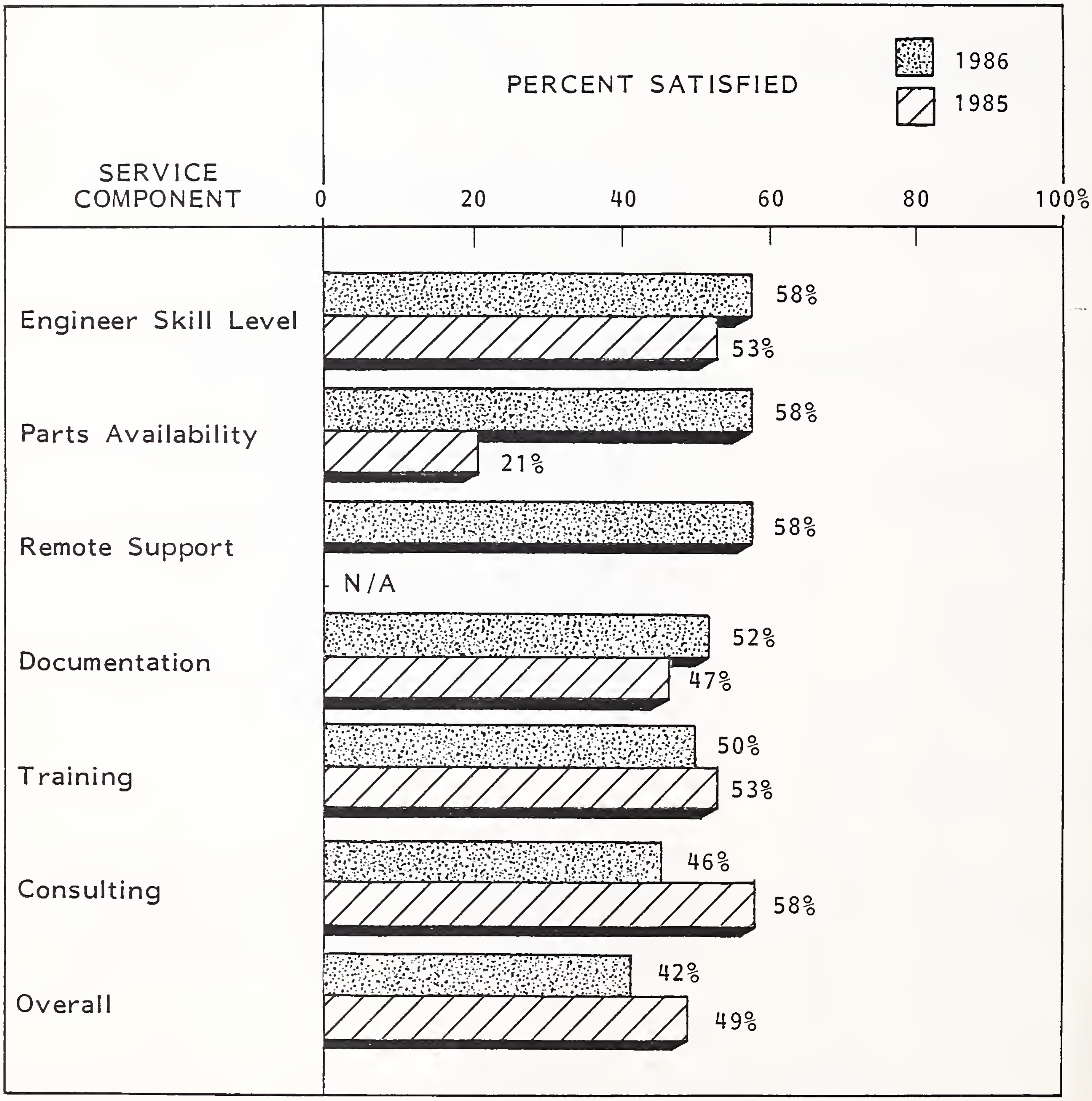
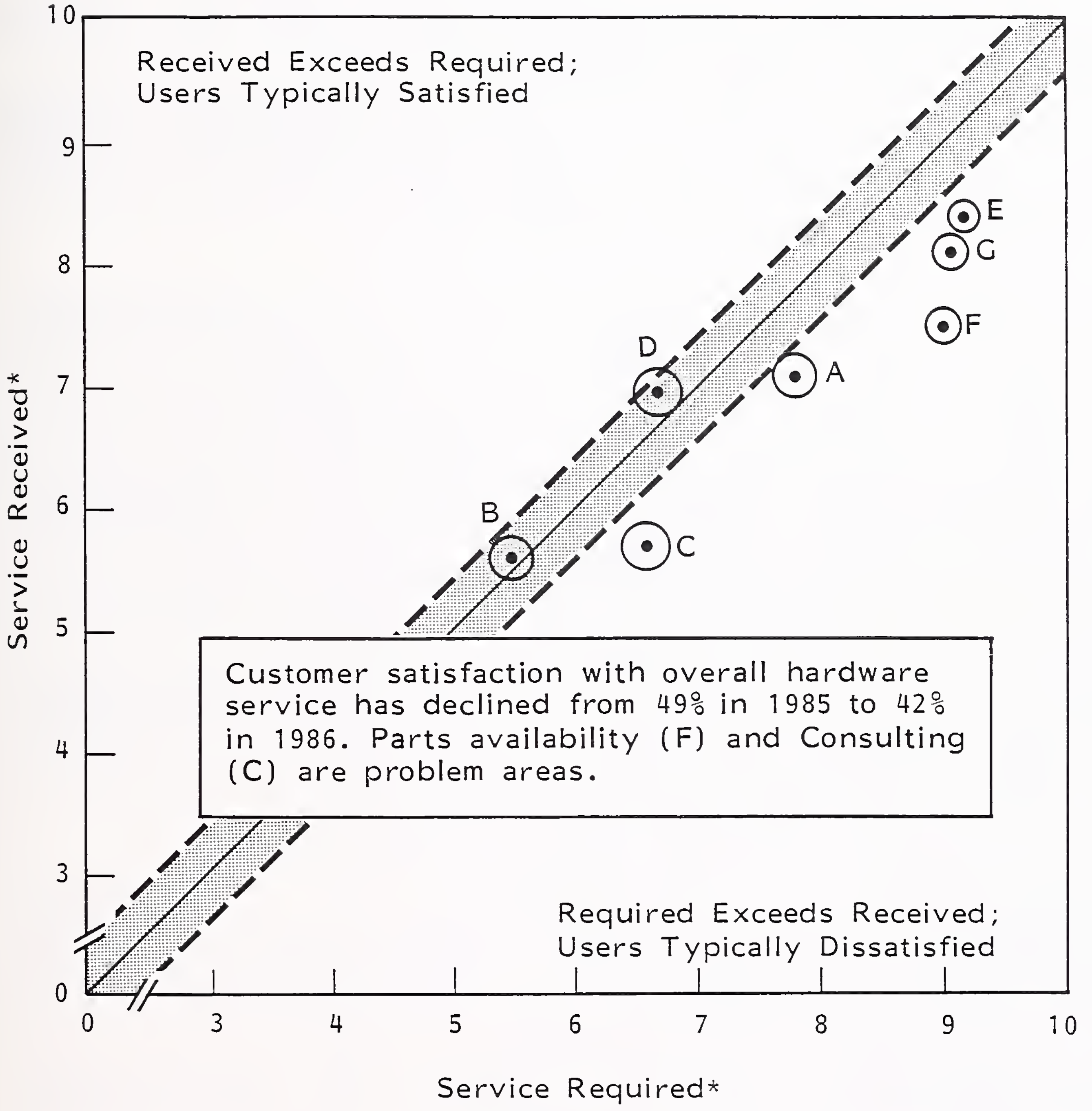


EXHIBIT III-H-4

HARDWARE SERVICES REQUIRED/RECEIVED
BURROUGHS



Customer satisfaction with overall hardware service has declined from 49% in 1985 to 42% in 1986. Parts availability (F) and Consulting (C) are problem areas.

A = Documentation
B = Training
C = Consulting
D = Remote Support

E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

greater the variance between the user expectation for service and the actual level of service delivered, the greater will be the impact on customer satisfaction.

- A similar pattern of vendor performance and user satisfaction with service is exhibited in the area of systems software support. Exhibit III-H-5 demonstrates that there has been very little statistically significant change in Burroughs' systems software service between 1985 and 1986. Users, however, expect a much higher level of service, as shown in Exhibit III-H-6. Burroughs fails to meet or exceed any of the users' service requirements in systems software, and the variance between requirement and level of service delivered is quite substantial in five out of the six key areas.

- User satisfaction with systems software service (see Exhibit III-H-7) is falling as a result of the company's inability to meet user expectations for service. Documentation is a major problem area in that users feel that they cannot get the level of service they require from the manufacturer and they don't even have the documentation necessary to establish their own support network. Significantly, Burroughs users tend to report very few user-caused interruptions, but rather feel that interruptions are almost always caused by failure of the hardware or software. This is just another example of the effect of increasing service expectations. Exhibit III-H-8 demonstrates that user needs for systems software support are not being met and that in areas such as documentation and remote support, the variance is quite substantial.

- Burroughs is one of only two large systems vendors to experience an increase in the number of system interruptions from 1985 to 1986 (Sperry being the other). Exhibit III-H-9 demonstrates that in most areas Burroughs improved their service; however, in key areas like number of interruptions and systems software response time, actual service performance did decline. Surprisingly, in many areas Burroughs actually exceeded user expectations for service performance (see Exhibit III-H-10). INPUT believes that while Burroughs has improved service, the company has not adequately addressed the underlying

EXHIBIT III-H-5

SYSTEMS SOFTWARE SERVICES PERFORMANCES
BURROUGHS

SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE		USER RATING*	
	Decline -1.5 -1.0 -0.5	Improve 0.5 1.0 1.5	1985	1986†
Documentation		0.5	5.8	6.3
Consulting		0.3	5.7	6.0
Engineer Skill Level		0.1	6.8	6.9
Training	-0.2		6.5	6.3
Service Overall	-0.5		7.0	6.5

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-H-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
BURROUGHS

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Consulting	6.5	6.0	(0.5)
Engineer Skill Level	8.4	6.9	(1.5)
Training	7.8	6.3	(1.5)
Service Overall	8.2	6.5	(1.7)
Remote Support	7.4	5.4	(2.0)
Documentation	8.5	6.3	(2.2)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-H-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICES
BURROUGHS

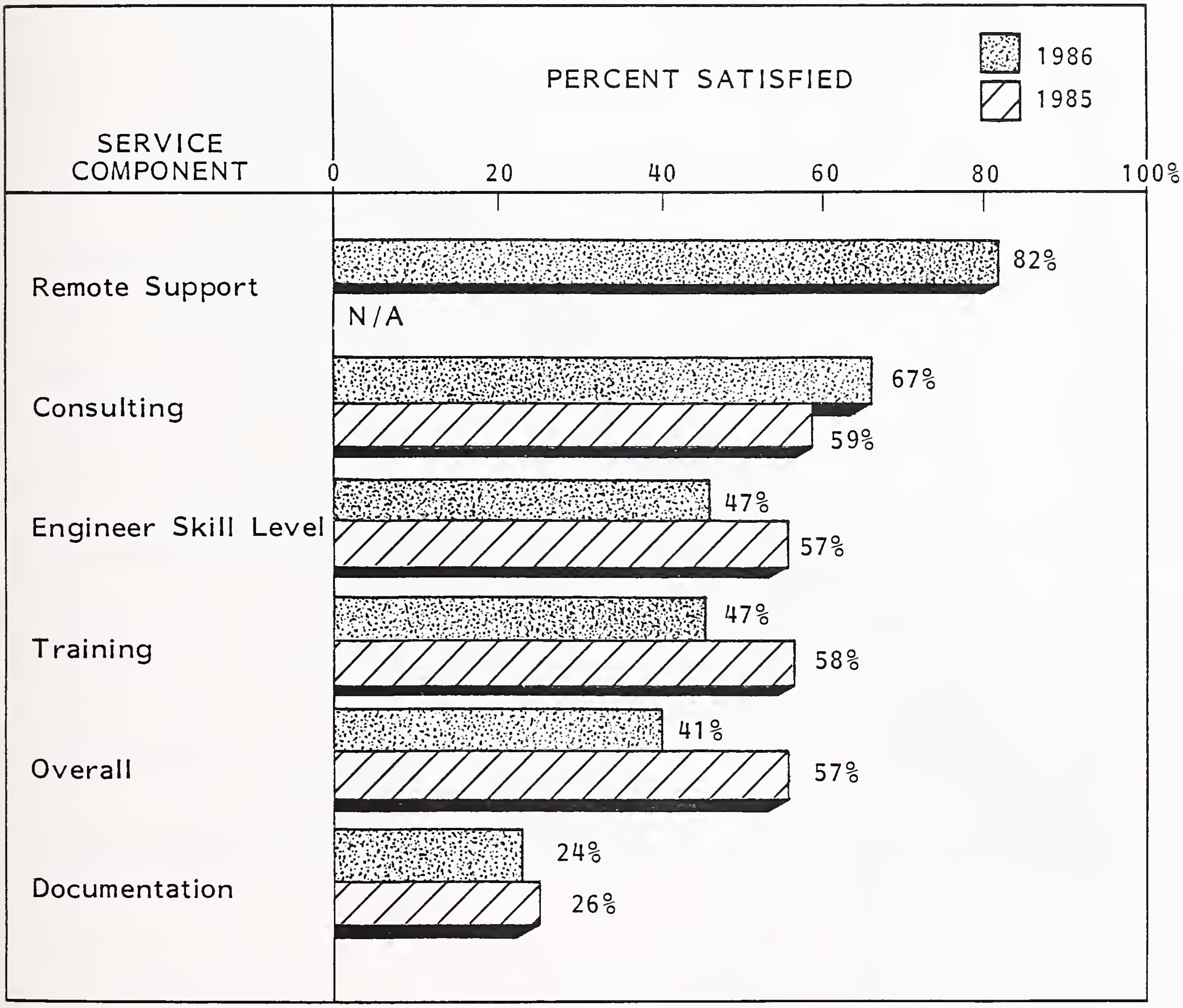
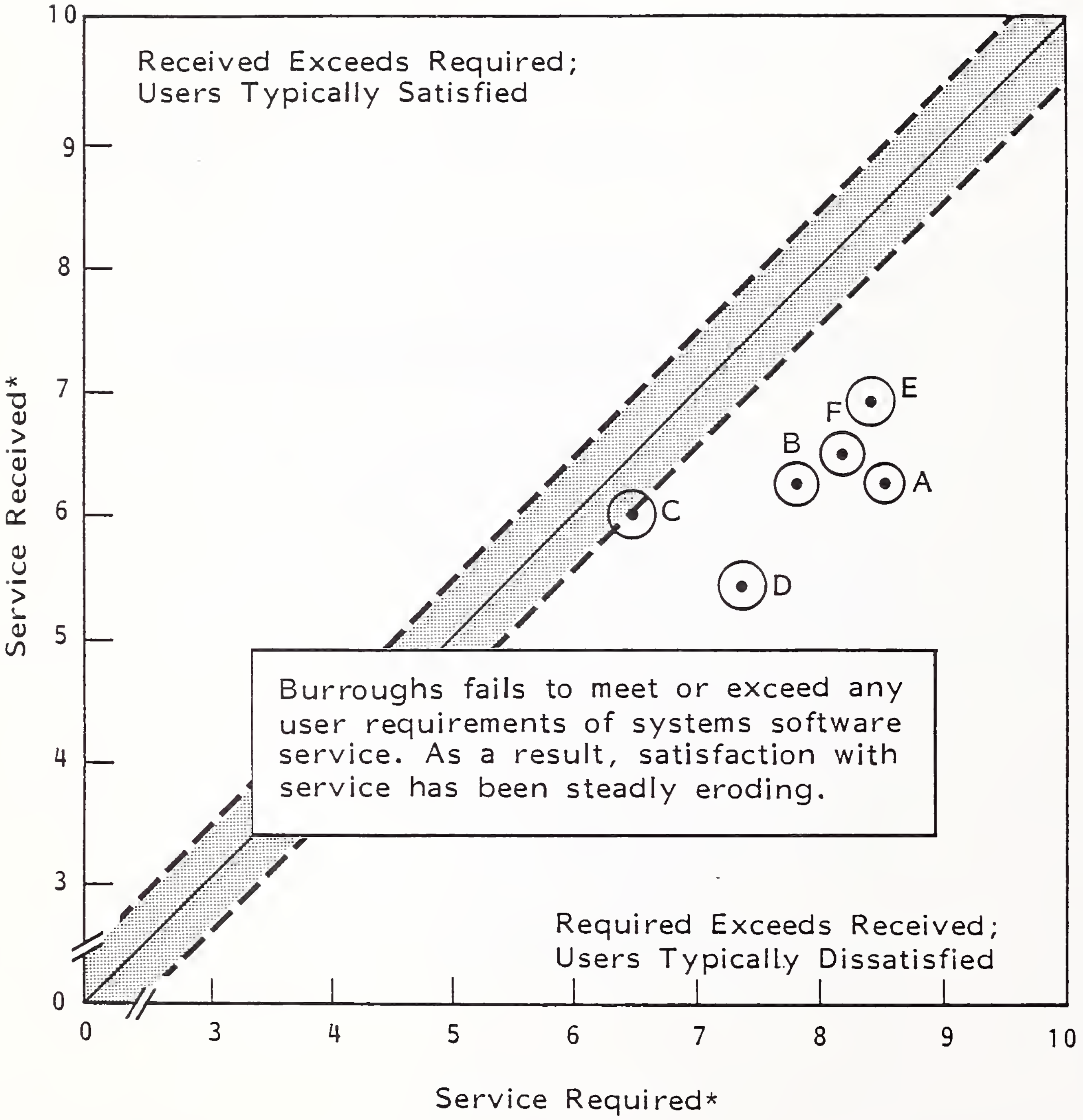


EXHIBIT III-H-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
BURROUGHS



A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-H-9

SERVICE PERFORMANCE
BURROUGHS

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	98.1%	98.9%
Average Number of Interruptions		
Per Month (Number)	3.0	3.3
Percent Hardware Caused	70.0%	67.0%
Percent Software Caused	23.0%	33.0%
Average Hardware Response Time (Hours)	1.9 hr.	0.8 hr.
Average Hardware Repair Time (Hours)	2.5 hr.	1.2 hr.
Average Systems Software Response Time (Hours)	5.7 hr.	11.8 hr.
Average Systems Software Repair Time (Hours)	>40.0 hr.	13.6 hr.

EXHIBIT III-H-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE
BURROUGHS

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent) Falls Short of Expectations 40% 30 20 10	VENDOR PERFORMANCE (Percent) Exceeds Expectations 10 20 30 40%
System Availability (Percent)	97.9%		0.1%
Hardware Response Time (Hours)	1.1 hr.		27%
Hardware Repair Time (Hours)	2.4 hr.		50%
Systems Software Response Time (Hours)	3.7 hr.	>100%	
Systems Software Repair Time (Hours)	18.7 hr.		27%

perception that service has declined. As a result, actual improvements have had a minimal impact on customer satisfaction.

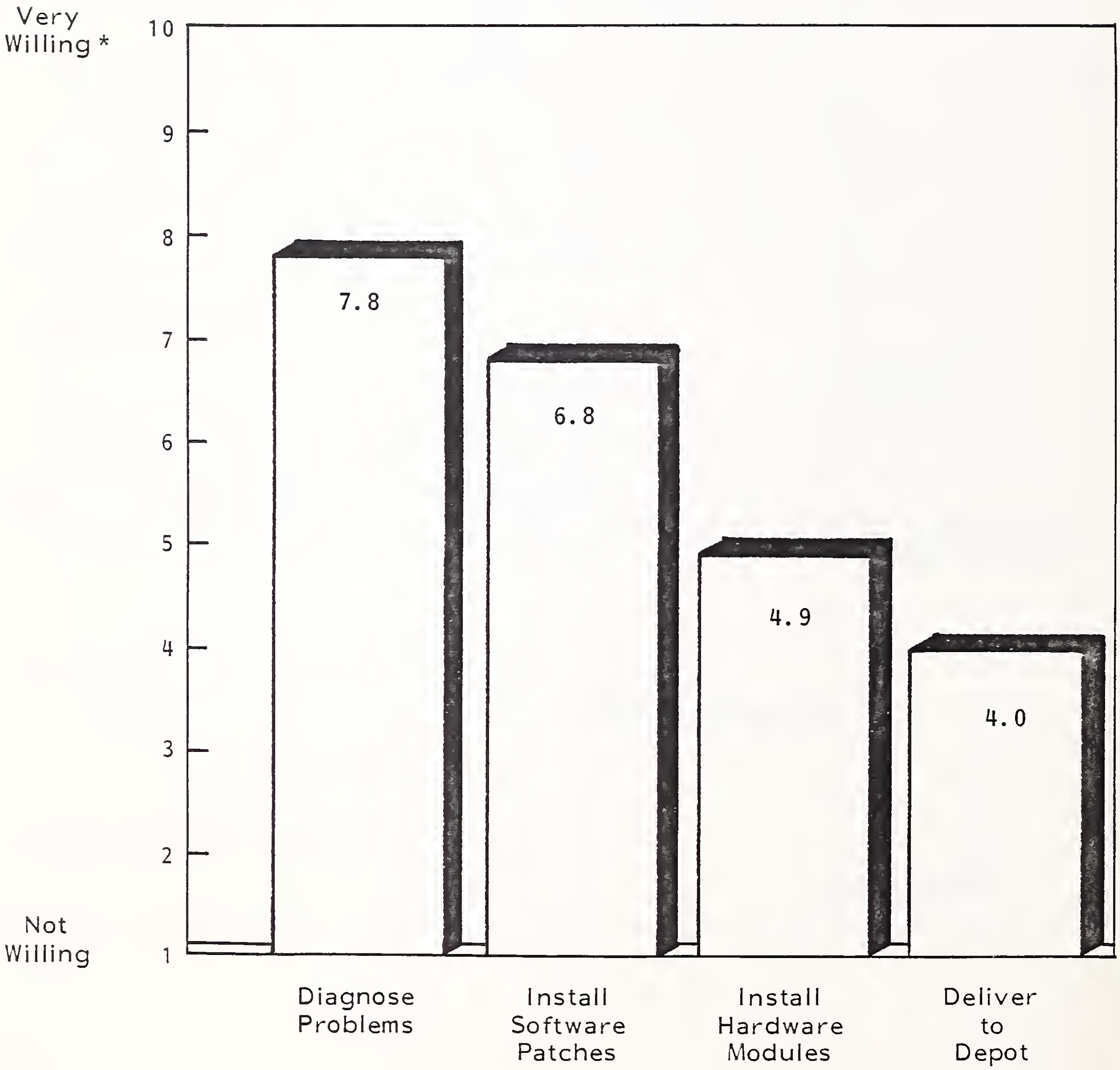
- Exhibit III-H-11 demonstrates that Burroughs users are not enthusiastic about becoming involved in hardware or software support. This is surprising considering the level of service users say they require. However, in many cases, users have a long standing relationship with Burroughs and are limited in the participation which is allowed. INPUT expects that user willingness to participate in service will increase dramatically as Burroughs continues to unbundle services in order to reduce on-site service expenditures.

- Use of third-party maintenance is charted in Exhibit III-H-12 and demonstrates that TPM contracts at Burroughs sites have fallen from 36% in 1985 to 30% in 1986. Burroughs, of course, does not participate in TPM, but with almost one-third of their user base impacted, INPUT expects the company to move in this direction if only to satisfy the multi-vendor service requirements of their own users.

- User requirements for extended services are listed in Exhibit III-H-13. It is significant that only 40% of Burroughs' large systems users require less than two-hour response time. This may offer an opportunity to Burroughs to segment their user base for greater profitability and customer satisfaction.

EXHIBIT III-H-11

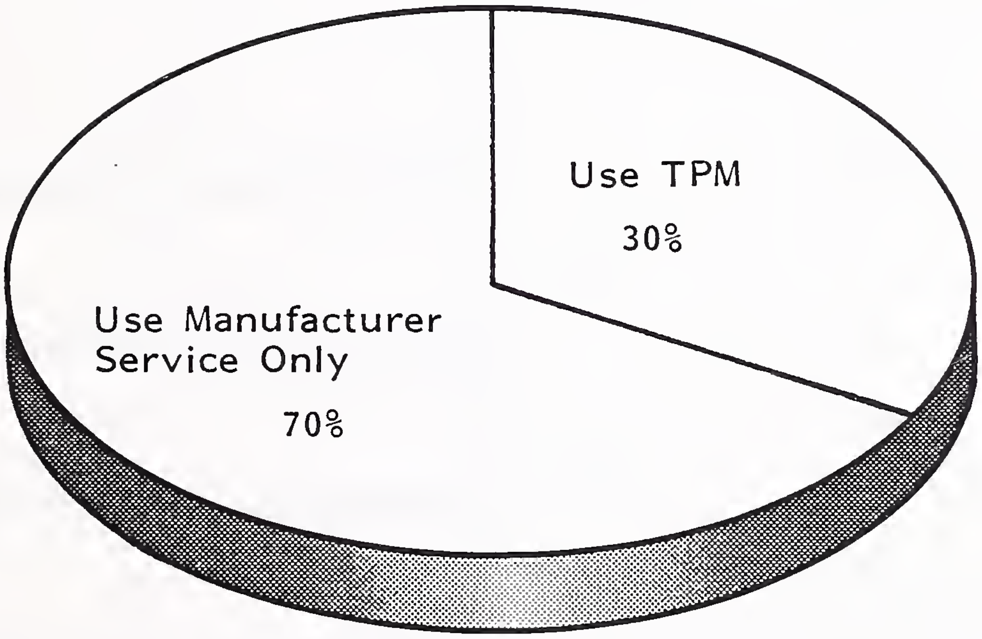
USER WILLINGNESS TO PERFORM MAINTENANCE
BURROUGHS



* Average Standard Error: 0.7

EXHIBIT III-H-12

CURRENT TPM USE
BURROUGHS



30% of Burroughs have third-party service on at least one piece of equipment at their site, down from 36% in 1985.

EXHIBIT III-H-13

USER REQUIREMENTS FOR EXTENDED SERVICES
BURROUGHS

SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT* Low High 1 2 3 4 5 6 7 8 9 10
Preventive Maintenance during Non-Prime Hours	90%	9.2
Standby Coverage	70	8.2
Remote Diagnostics	70	8.1
Under Two-Hour Response	40	8.5
Deferred Response	30	7.8
Maintenance Management	20	8.8

*Average Standard Error: 0.5

III I. ALL MAINFRAME VENDORS

- A total of 210 mainframe users were interviewed between January and March 1986. Approximately 80% of the interviews were conducted with operations managers and/or data processing managers. The interviews were evenly distributed geographically and by industry served. The overall breakdown of interviews is as follows:

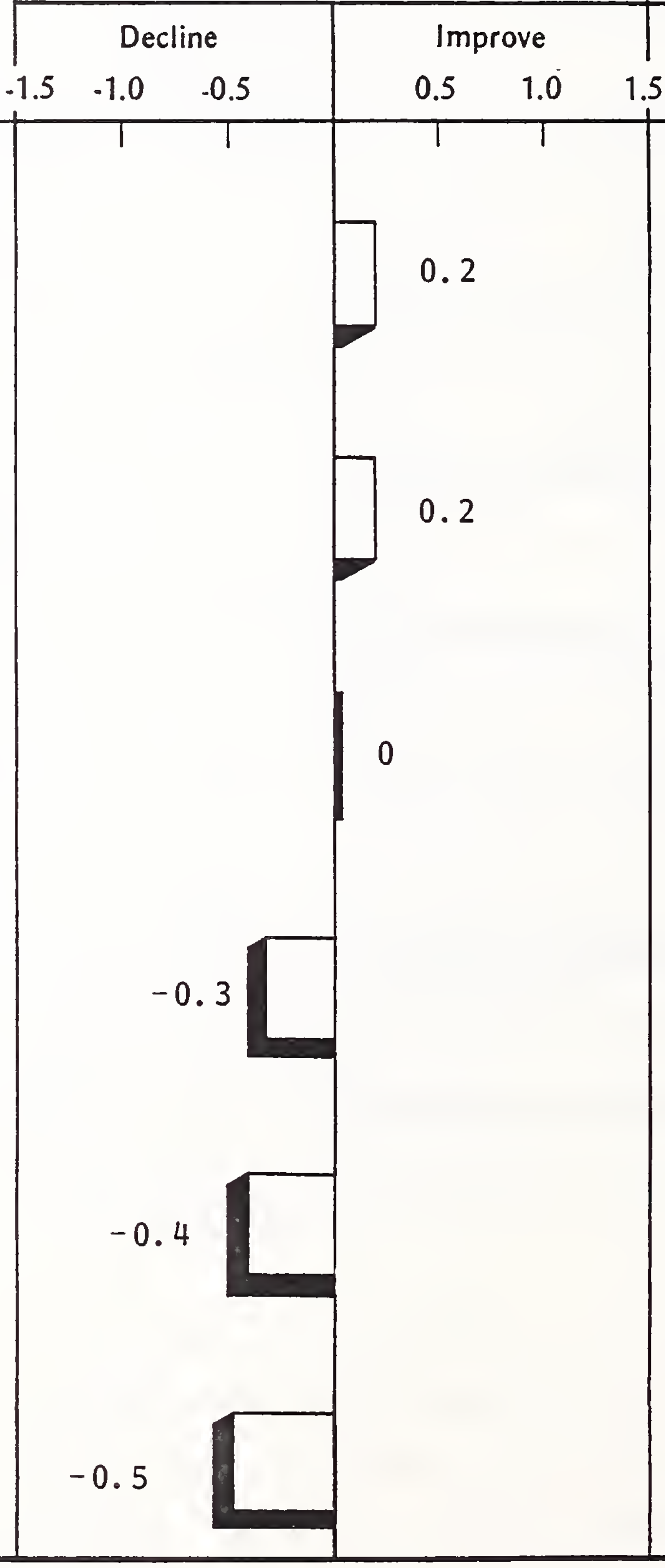
Vendor	Product	No. of Interviews
Amdahl	58XX	25
Burroughs	B7XXX	20
CDC	170,180/8XX	25
Honeywell	DPS 8	20
IBM	4381	25
IBM	308X	25
NAS	AS/9XXX	25
NCR	85XX	25
Sperry	1100	20
	Total	210

- Exhibit III-I-1 demonstrates that mainframe user ratings of service have remained stable in most hardware support categories. Users noted a marginal decline in hardware documentation and a statistically significant decline in the level of training. INPUT believes that the decline in service is more the result of growing expectations for service by the user base than any actual decline in service performance by the vendors.

- User expectations for mainframe service (see Exhibit III-I-2) are generally satisfied for low-priority services; however, high-priority service expectations are not being met. Parts availability is consistently rated as one of the most important hardware services, yet vendor performance in this area is rated very low.

EXHIBIT III-I-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
ALL MAINFRAME VENDORS



HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING* 1985	USER RATING* 1986†
Parts Availability	0.2	7.5	7.7
Engineer Skill Level	0.2	8.2	8.4
Consulting	0	7.0	7.0
Documentation	-0.3	7.3	7.0
Service Overall	-0.4	8.2	7.8
Training	-0.5	7.1	6.6

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.2

EXHIBIT III-I-2

1986 USER HARDWARE SERVICE RATINGS
ALL MAINFRAME VENDORS

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Parts Availability	9.1	7.7	(1.4)
Engineer Skill Level	9.0	8.4	(0.6)
Hardware Service Overall	8.5	7.8	(0.7)
Documentation	7.1	7.0	(0.1)
Consulting	6.9	7.0	0.1
Training	6.7	6.6	(0.1)
Remote Support	6.1	6.9	0.8

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.2

- Overall satisfaction with mainframe hardware service has been declining, as shown in Exhibit III-I-3. INPUT believes that continuing dissatisfaction with parts availability and remote support (two important service areas to most mainframe users) is having a major impact on user evaluation of overall support. Engineer skill level, although improved from 1985 to 1986, is also an area of concern for many mainframe users. As manufacturers continue to stress the increased reliability of their systems, user expectations for remote support, parts availability, and trained engineers will continue to escalate.

- Exhibit III-I-4 graphically illustrates the relationship between user requirements for service and the level of service actually received from the manufacturer. The exhibit demonstrates that in only two areas (consulting and remote support) are user expectations met or exceeded. The highest variance between user requirements and the level of service received is in the high-priority services (FE skill level, parts availability, and overall hardware service).

- Systems software support from mainframe vendors has not changed substantially from 1985 to 1986, as demonstrated in Exhibit III-I-5. In most cases, users report the same level of service now as they received last year. However, as Exhibit III-I-6 demonstrates, user expectations for systems software support continue to increase. As a result, the level of systems software service delivered by mainframe manufacturers falls far below user requirements. Significantly, the greatest variance between the level of support required by the user and the service received is in software documentation--the most important category of systems software support according to mainframe users.

- Considering the wide variance between user requirements for service and the level of service received, it is not surprising that user satisfaction with systems software support is down (see Exhibit III-I-7). Overall satisfaction (43%) is at the lowest level since INPUT started collecting data in this area in

EXHIBIT III-I-3

USER SATISFACTION: HARDWARE SERVICE
ALL MAINFRAME VENDORS

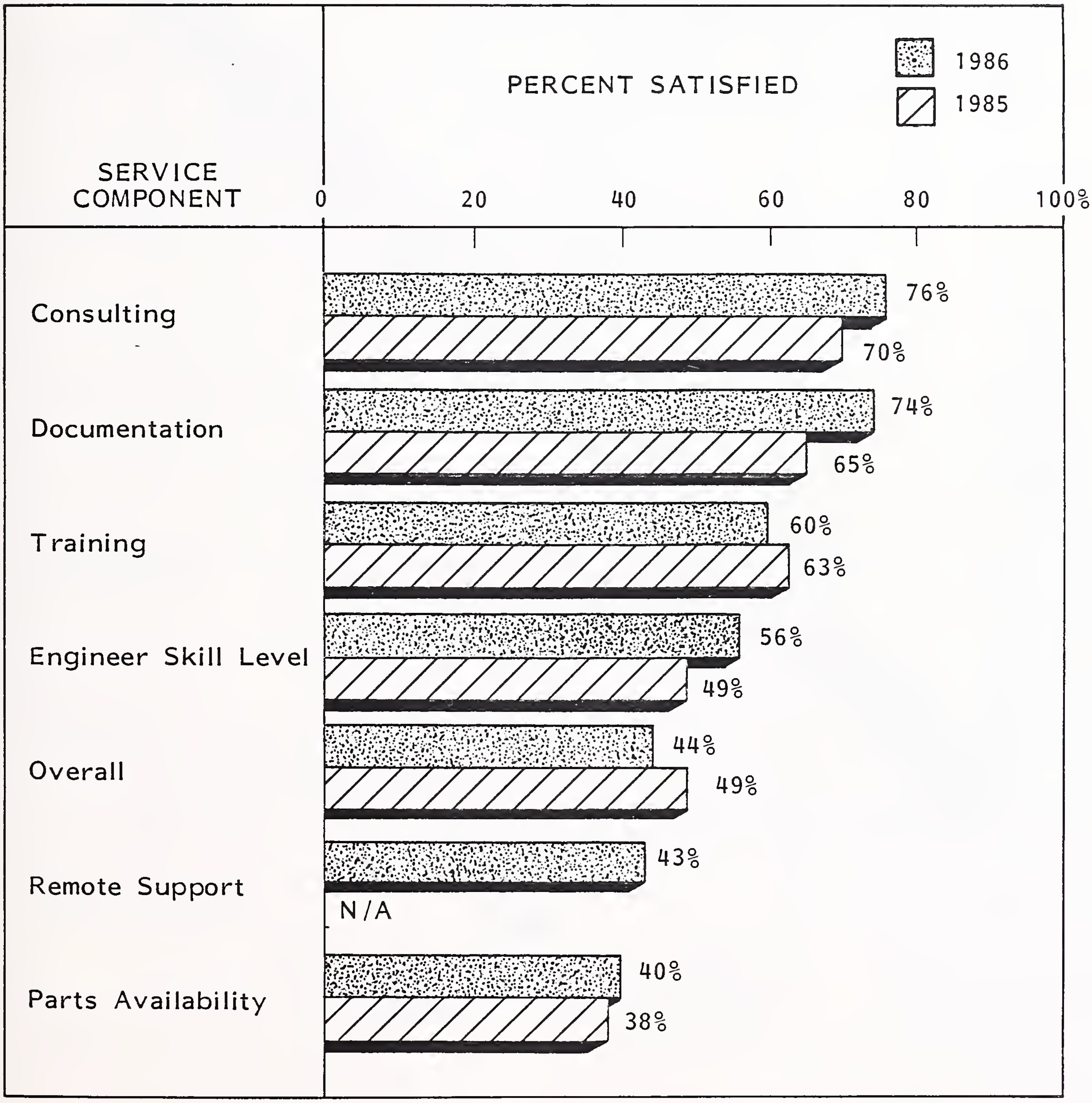
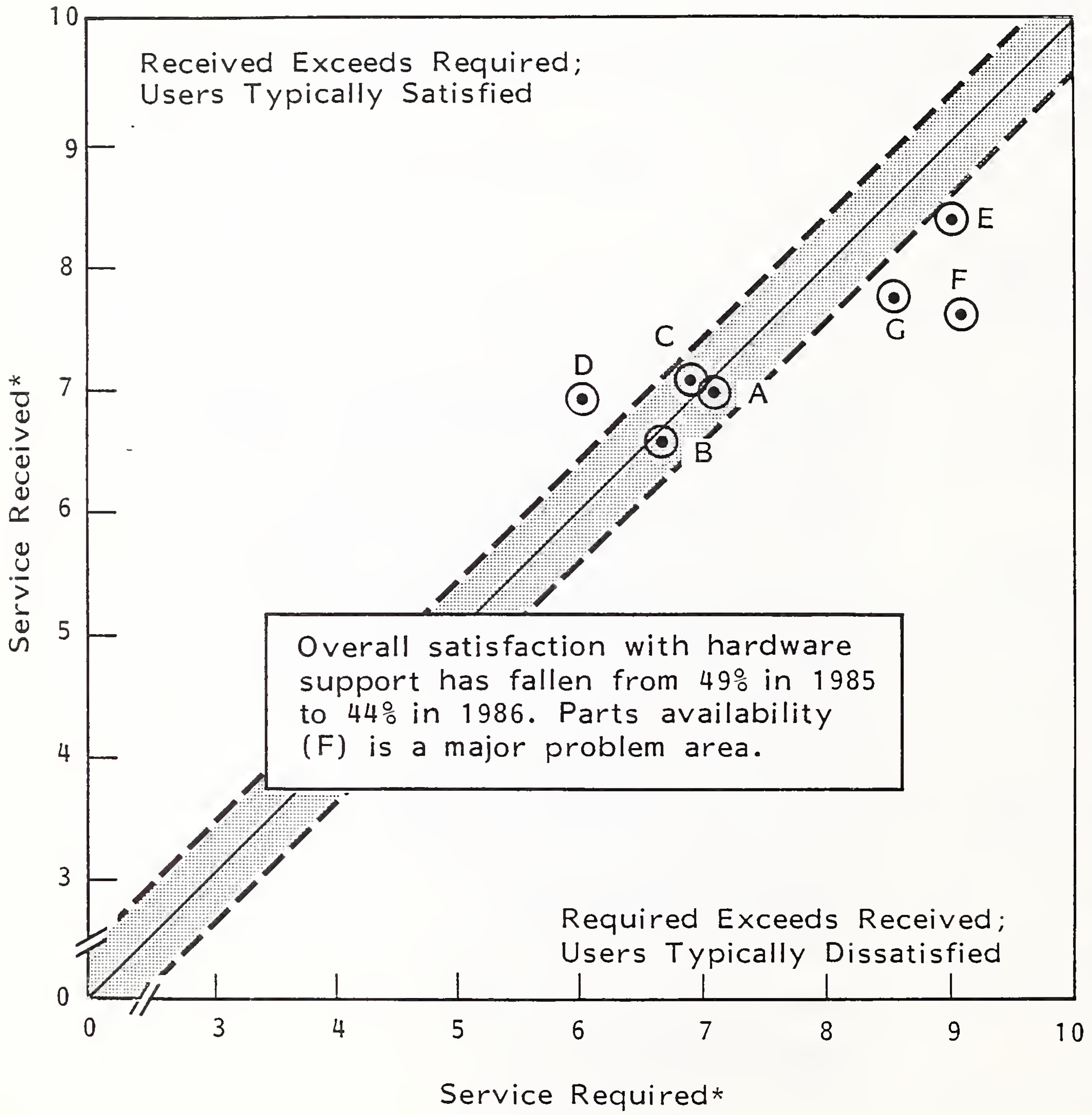


EXHIBIT III-1-4

HARDWARE SERVICES REQUIRED/RECEIVED
ALL MAINFRAME VENDORS



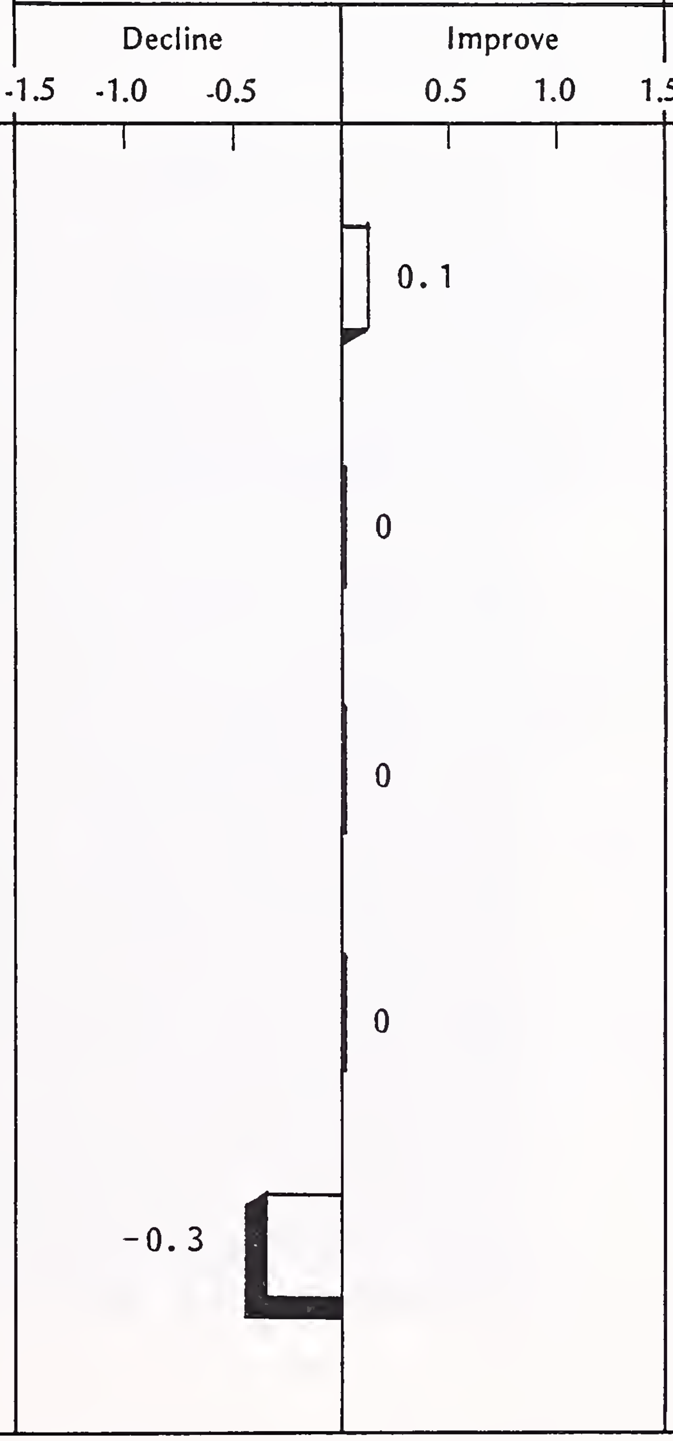
Overall satisfaction with hardware support has fallen from 49% in 1985 to 44% in 1986. Parts availability (F) is a major problem area.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-I-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
ALL MAINFRAME VENDORS



SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING*	
		1985	1986†
Consulting	0.1	6.8	6.9
Engineer Skill Level	0	7.4	7.4
Documentation	0	7.0	7.0
Training	0	6.9	6.9
Service Overall	-0.3	7.1	6.8

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.2

EXHIBIT III-1-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
ALL MAINFRAME VENDORS

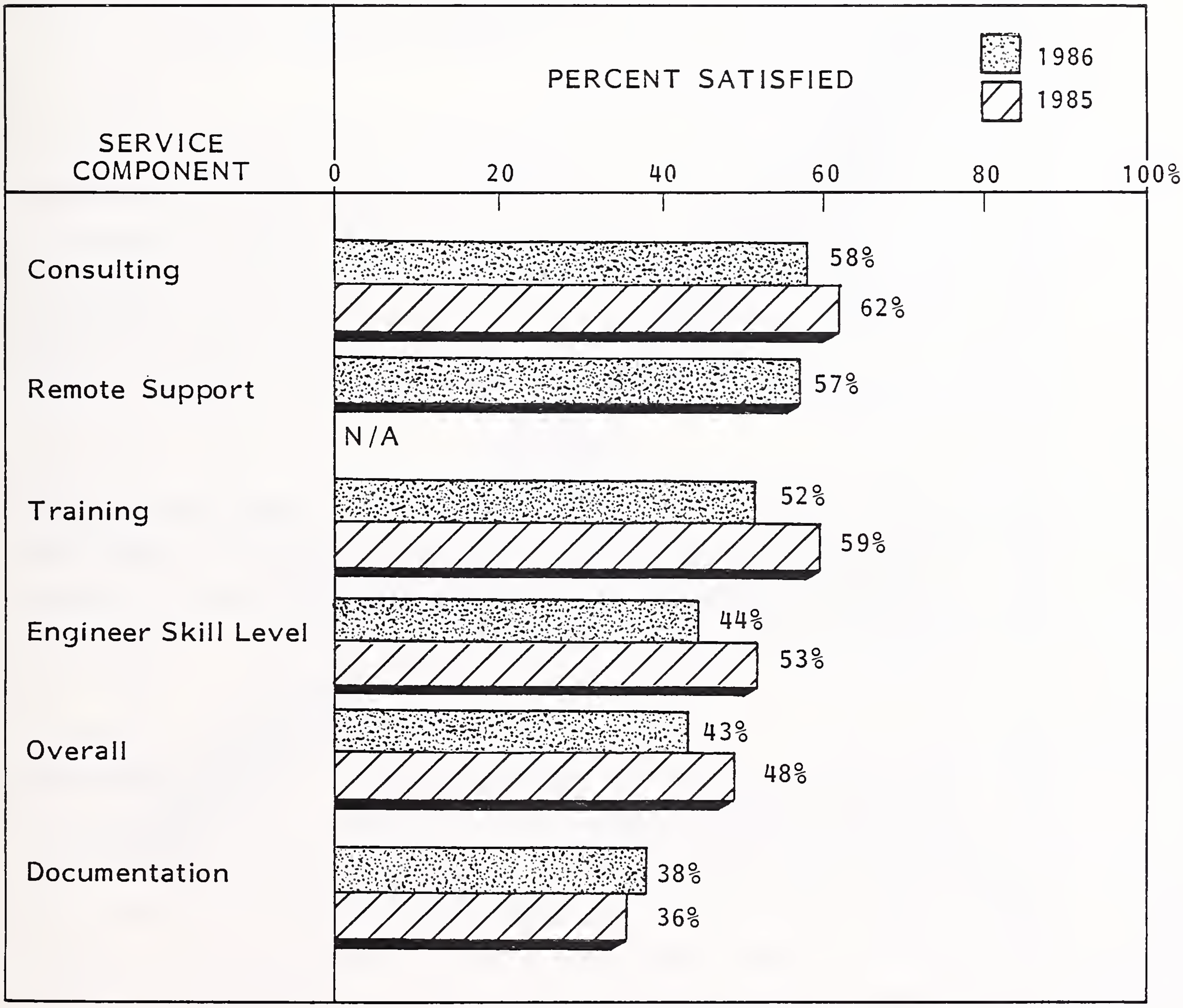
SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required	Received	
Remote Support	7.2	6.8	(0.4)
Training	7.4	6.9	(0.5)
Engineer Skill Level	8.4	7.4	(1.0)
Consulting	7.0	6.9	(0.1)
Service Overall	8.0	6.8	(1.2)
Documentation	8.5	7.0	(1.5)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

EXHIBIT III-I-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICES ALL MAINFRAME VENDORS



the early 1980s. Users are demanding a higher level of primary support (documentation, remote support, improved SE training, and better escalation procedures), but are not as concerned with custom programming.

- Exhibit III-1-8 demonstrates that user expectations for systems software support are not being met. User expectations for software service already equal or exceed hardware service expectations, and INPUT believes that unless manufacturers dedicate additional resources to software, service users will look to TPM vendors for support.

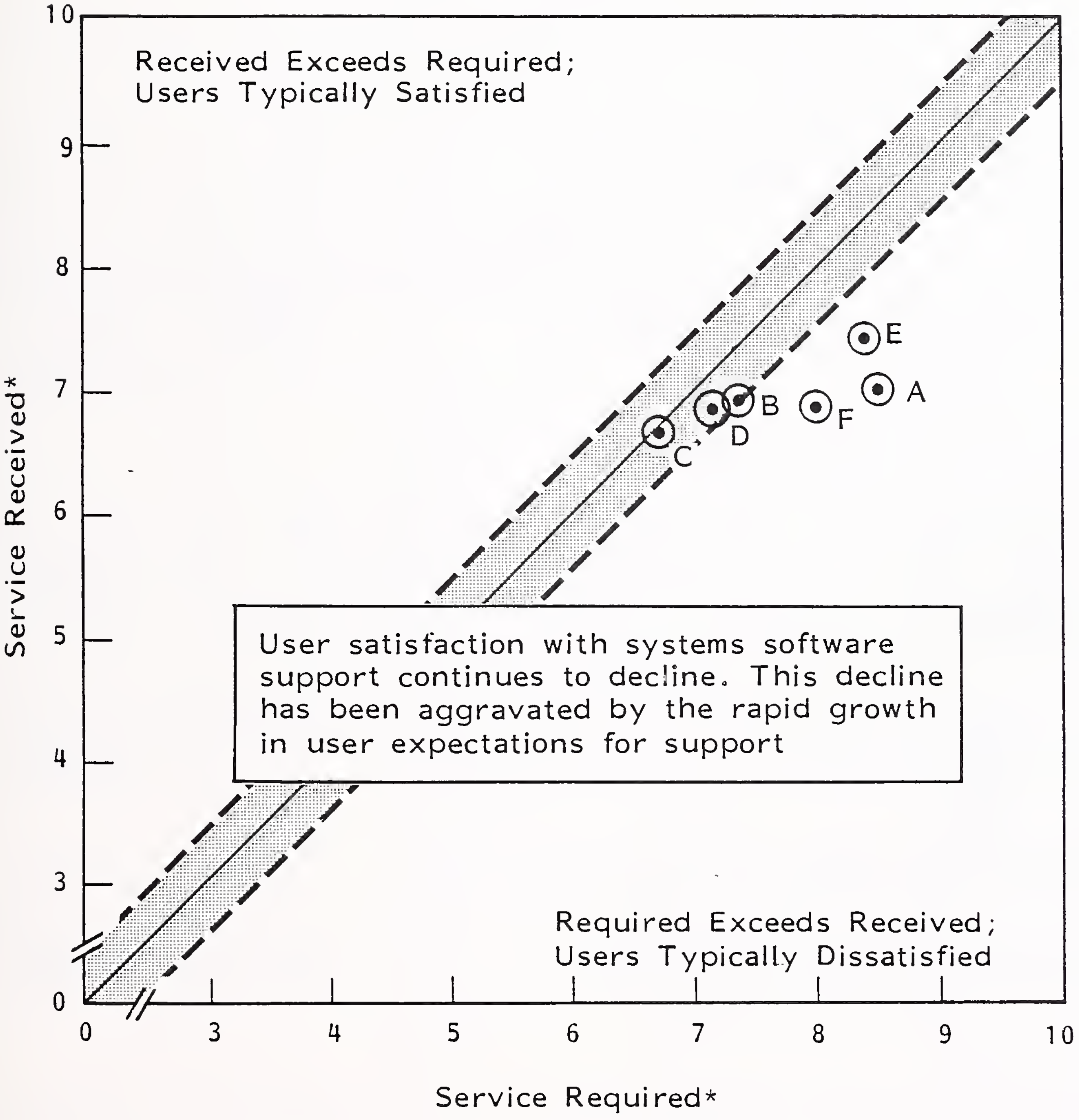
- Despite the fact that user satisfaction rates are declining in a number of areas, quantifiable performance, as shown in Exhibit III-1-9, has improved. Average systems availability has improved from 1985 to 1986, the number of interruptions has declined, hardware response time has improved, and systems software response and repair time has declined. In only one area has service actually not improved--average hardware repair time--and that is due primarily to lack of spare parts.

- But even with major improvements in actual service performance, users remain dissatisfied because their expectations for service are still not being met. For example, mainframe users reported a 50% improvement in systems software repair time from 1985 to 1986 (31.4 hours to 15.2).

- However, as Exhibit III-1-10 demonstrates, users expected an 11 hour repair time, 40% better than what they actually received. Many manufacturers believe that users will always expect better service than they are getting, but the exhibit also shows that manufacturers are exceeding user expectations for hardware response and repair times. Users expect a high level of service for systems software support simply because they are depending on this product more and more. As dependence increases, so do the requirement for service and the opportunities for revenue.

EXHIBIT III-I-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
ALL MAINFRAME VENDORS



A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-1-9

SERVICE PERFORMANCE
ALL MAINFRAME VENDORS

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	97.5%	98.3%
Average Number of Interruptions		
Per Month (Number)	2.6	1.9
Percent Hardware Caused	60.0%	60.0%
Percent Software Caused	31.0%	30.0%
Average Hardware Response Time (Hours)	1.5 hr.	1.2 hr.
Average Hardware Repair Time (Hours)	2.5 hr.	2.7 hr.
Average Systems Software Response Time (Hours)	6.3 hr.	5.1 hr.
Average Systems Software Repair Time (Hours)	31.4 hr.	15.2 hr.

EXHIBIT III-1-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE
ALL MAINFRAME VENDORS

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent) Falls Short of Expectations 40% 30 20 10	VENDOR PERFORMANCE (Percent) Exceeds Expectations 10 20 30 40%
System Availability (Percent)	98.1%		0%
Hardware Response Time (Hours)	1.4 hr.		14%
Hardware Repair Time (Hours)	2.9 hr.		7%
Systems Software Response Time (Hours)	3.6 hr.	42 %	
Systems Software Repair Time (Hours)	10.9 hr.	39%	

- User willingness to become involved in the maintenance process is shown in Exhibit III-I-11. Most users say they are willing to perform diagnostics; most are already involved in this process. Mainframe users are also interested in some types of software support. Users are clearly dissatisfied with manufacturer-supplied service in this area and believe they must perform some maintenance activities themselves. While INPUT expects user involvement in systems software support to decline as manufacturers improve their service in this area, it is an indication that the user may be considered "hands on-site" if necessary.

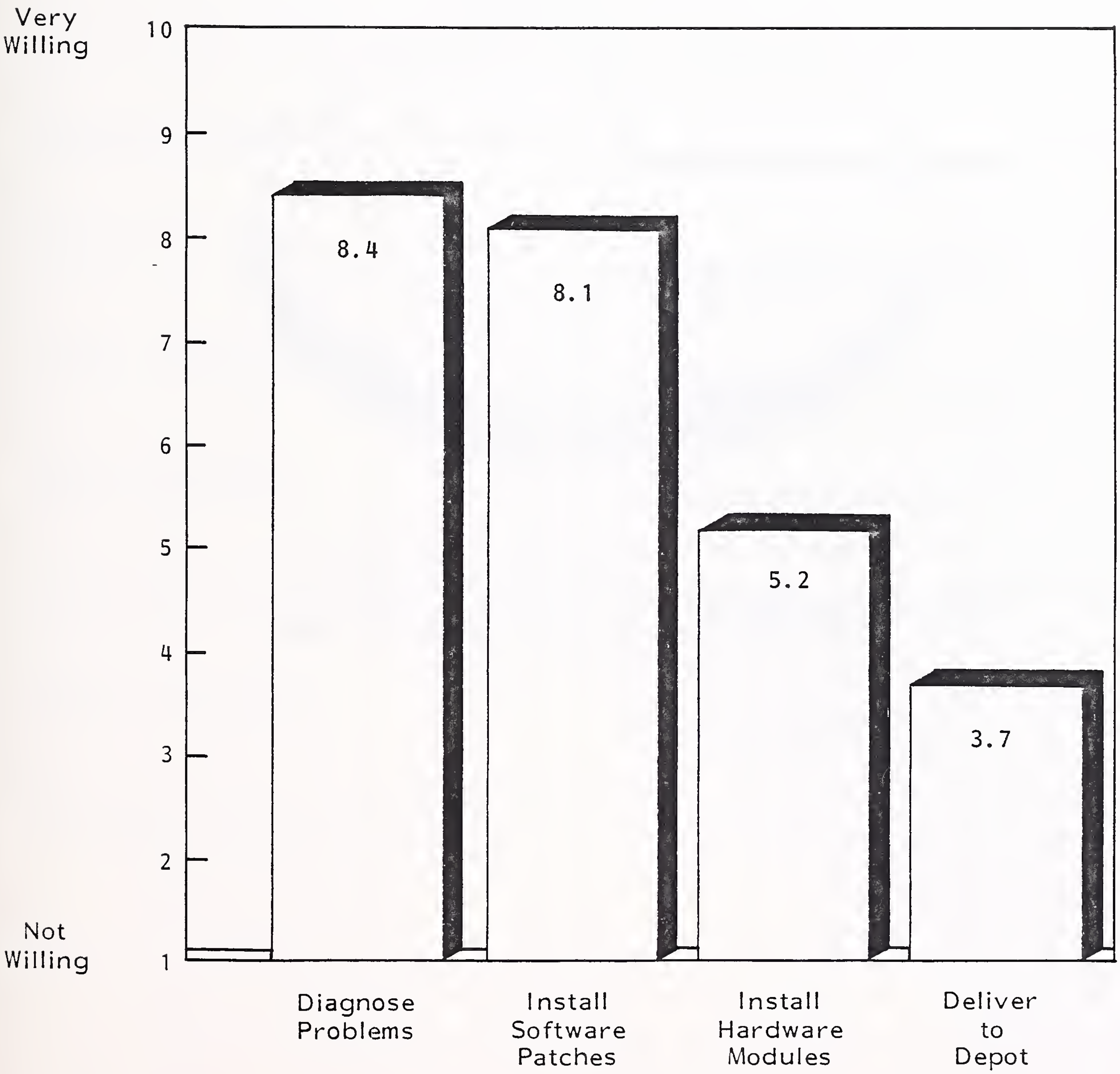
- Involvement in hardware maintenance and/or depot delivery is rated as a low priority by most large systems users. Even when the product is transportable (e.g., terminals, IC boards, etc.), users are not willing to become involved due to a lack of training or a lack of time.

- Third-party maintenance use (see Exhibit III-I-12) among mainframe users has remained stable from 1985 to 1986. Most mainframe users have TPM contracts on peripheral devices such as disk drives and terminals. However, a growing number of users report contracting with TPM vendors for service on older CPUs (typically departmental systems). Although price is always a consideration, users indicated that one of their prime motivations for selecting TPMs for outdated equipment is parts availability and contract flexibility.

- Users are clearly becoming more sophisticated in evaluating service needs. While this sophistication has a downside in that users are more demanding of their service vendors, it also has an upside in that users appreciate that they must pay premiums for extended services. Exhibit III-I-13 lists some of the extended services required by mainframe users. As expected, the vast majority of mainframe users require PM during non-prime hours. An important point, however, is not that 75% require non-prime PM, but rather that 25% will schedule PM during prime time hours. This may offer an excellent opportunity to mainframe manufacturers for segmenting their user population and scheduling PM during the most opportune times.

EXHIBIT III-I-11

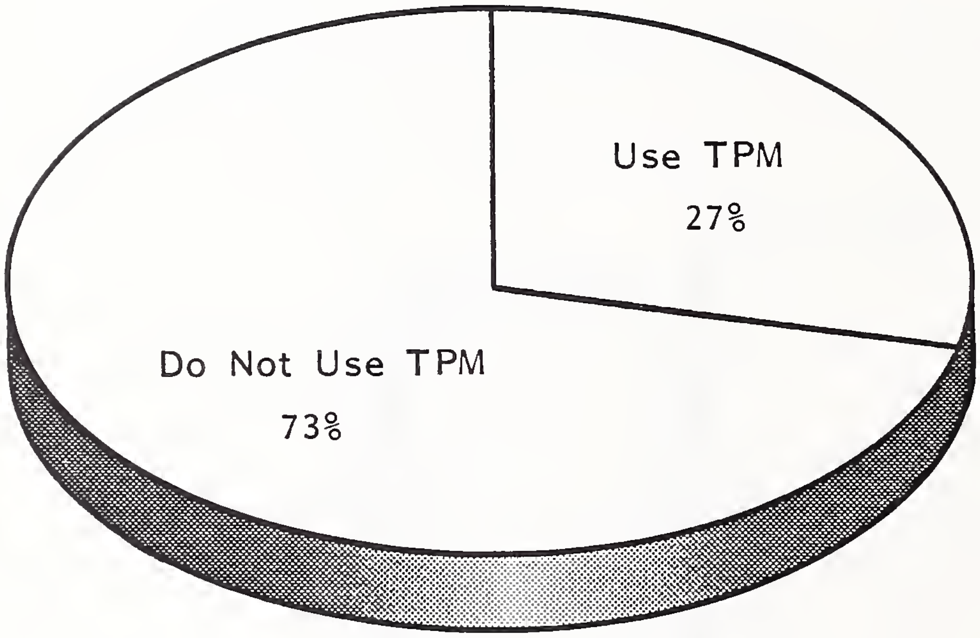
USER WILLINGNESS TO PERFORM MAINTENANCE
ALL MAINFRAME VENDORS



* Average Standard Error: 0.2

EXHIBIT III-I-12

CURRENT TPM USE
ALL MAINFRAME VENDORS

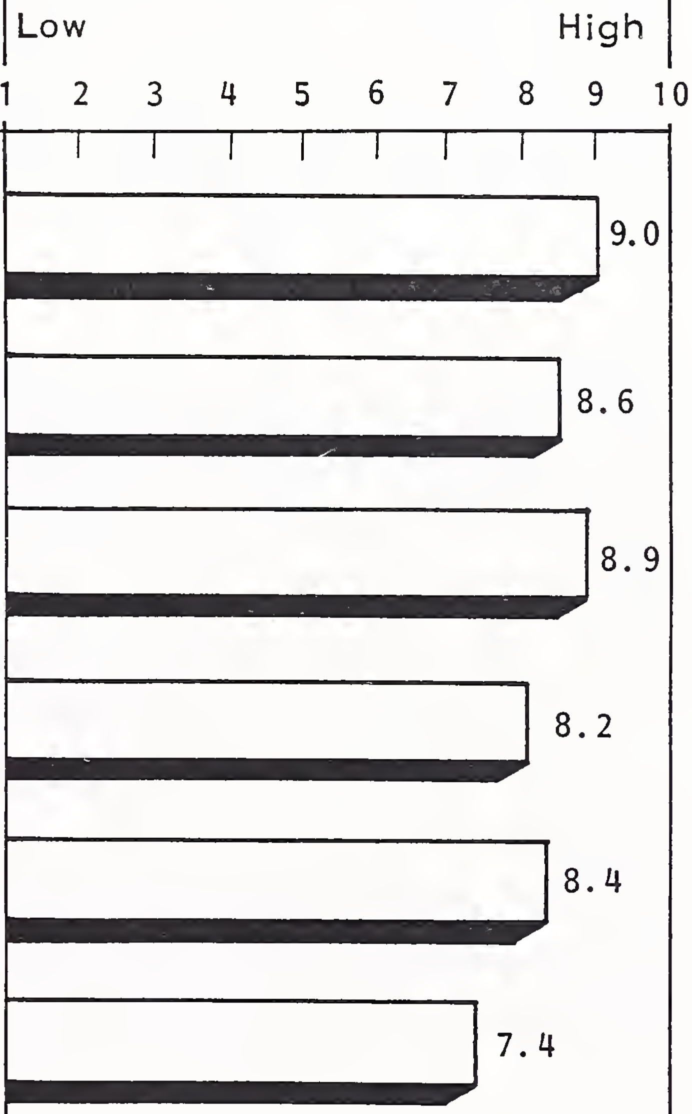


27% of all Mainframe System users have at least one piece of DP equipment serviced by a TPM vendor, compared to 29% in 1985.

EXHIBIT III-I-13

USER REQUIREMENTS FOR EXTENDED SERVICES ALL MAINFRAME VENDORS

SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT*
Preventive Maintenance during Non-Prime Hours	75%	9.0
Standby Coverage	62	8.6
Under Two-Hour Response	54	8.9
Remote Diagnostics	53	8.2
Maintenance Management	38	8.4
Deferred Response	15	7.4



*Average Standard Error: 0.3

- Segmentation of the user base is also evident in the small group of mainframe users who say they do have a requirement for deferred response time. Although this is only 15% of the overall sample, it does indicate that low-end segmentation is taking place. By improving service product flexibility, INPUT believes that manufacturers can more accurately target user service needs and, as a result, improve user satisfaction and increase service profitability.

III J. CONCURRENT COMPUTER CORPORATION

- In April 1986 INPUT interviewed 25 Concurrent 32XX superminicomputer users regarding their current satisfaction with the level of service received versus their required levels of service. All interviews were performed over the telephone, each lasting approximately 20 minutes. As always, INPUT has targeted data processing and operations managers as responsents; however, the very nature of Concurrent's market required that we interview engineering managers as well. Not surprisingly, our sample had a concentration of process manufacturers (with 24% of the sample), discrete manufacturers (20%), and services (also 20%) which presumably target manufacturing companies.

- Exhibit III-J-1 illustrates that Concurrent has made marked improvements in the areas of professional and educational services, both considered key areas of the engineering and scientific marketplace in which Concurrent participates. However, Concurrent users indicate concern over FE skill level, with a perceived drop in performance within the acceptable limits of the standard error of the mean. This concern is highlighted again in Exhibit III-J-2, which demonstrates that FE skill level falls well below user requirements. In addition, users are still concerned with spare parts availability, even though improvement was recognized in this area. Still, the high system availability requirements of these users place unusually high requirements on vendors to assure that the downtime caused or increased as a result of unavailable spare parts is minimized. As a result of these two factors, overall user satisfaction for service suffers.

- Exhibit III-J-3 demonstrates increased Concurrent user satisfaction with such post-sales services as training and consulting. The exhibit shows that user satisfaction with FE skill level has risen dramatically between 1985 and 1986, suggesting that, in light of the drop in actual performance in Exhibit III-J-1, user requirement for FE skill level in 1985 was relatively low. Again, the

EXHIBIT III-J-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
CONCURRENT

HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE (Decline -1.5 to Improve 1.5)	USER RATING* 1985	USER RATING* 1986†
Documentation	-0.1	7.4	7.3
Training	0.9	6.4	7.3
Consulting	1.0	6.3	7.3
Engineer Skill Level	-0.6	8.6	8.0
Parts Availability	0.1	7.5	7.6
Service Overall	-0.4	8.6	8.2

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-J-2

1986 USER HARDWARE SERVICE RATINGS
CONCURRENT

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	▨ 7.6	▨ 7.3	▨ (0.3)
Training	6.6	7.7	1.1
Consulting	6.9	7.3	0.4
Remote Support	4.7	6.8	2.1
Engineer Skill Level	▨ 8.9	▨ 8.0	▨ (0.9)
Parts Availability	▨ 9.1	▨ 7.6	▨ (1.5)
Hardware Service Overall	▨ 9.2	▨ 8.2	▨ (1.0)

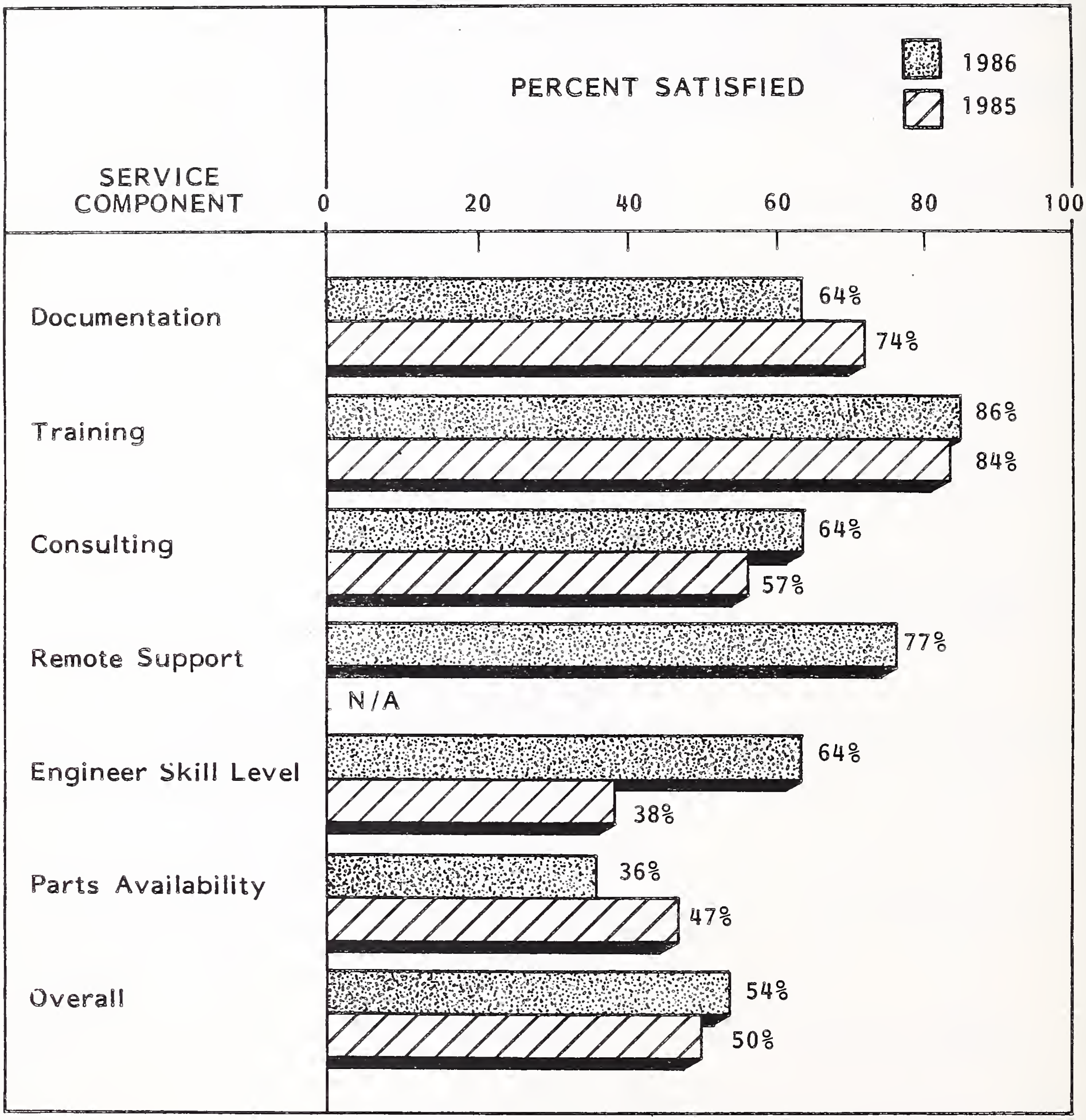
▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-J-3

USER SATISFACTION: HARDWARE SERVICE CONCURRENT



greatest concern should be placed on spares, since the exhibit demonstrates a significant decline in the percentage of Concurrent users who are satisfied (47% in 1985 and only 36% in 1986). Exhibit III-J-4 graphically plots the relationship between user requirements for a particular service and the level that they receive. Note that parts availability, FE skill level, and overall satisfaction with hardware service are both highest in importance and farthest from the line representing the target area. Concurrent needs to focus their attention on reducing the service gap in these key service areas.

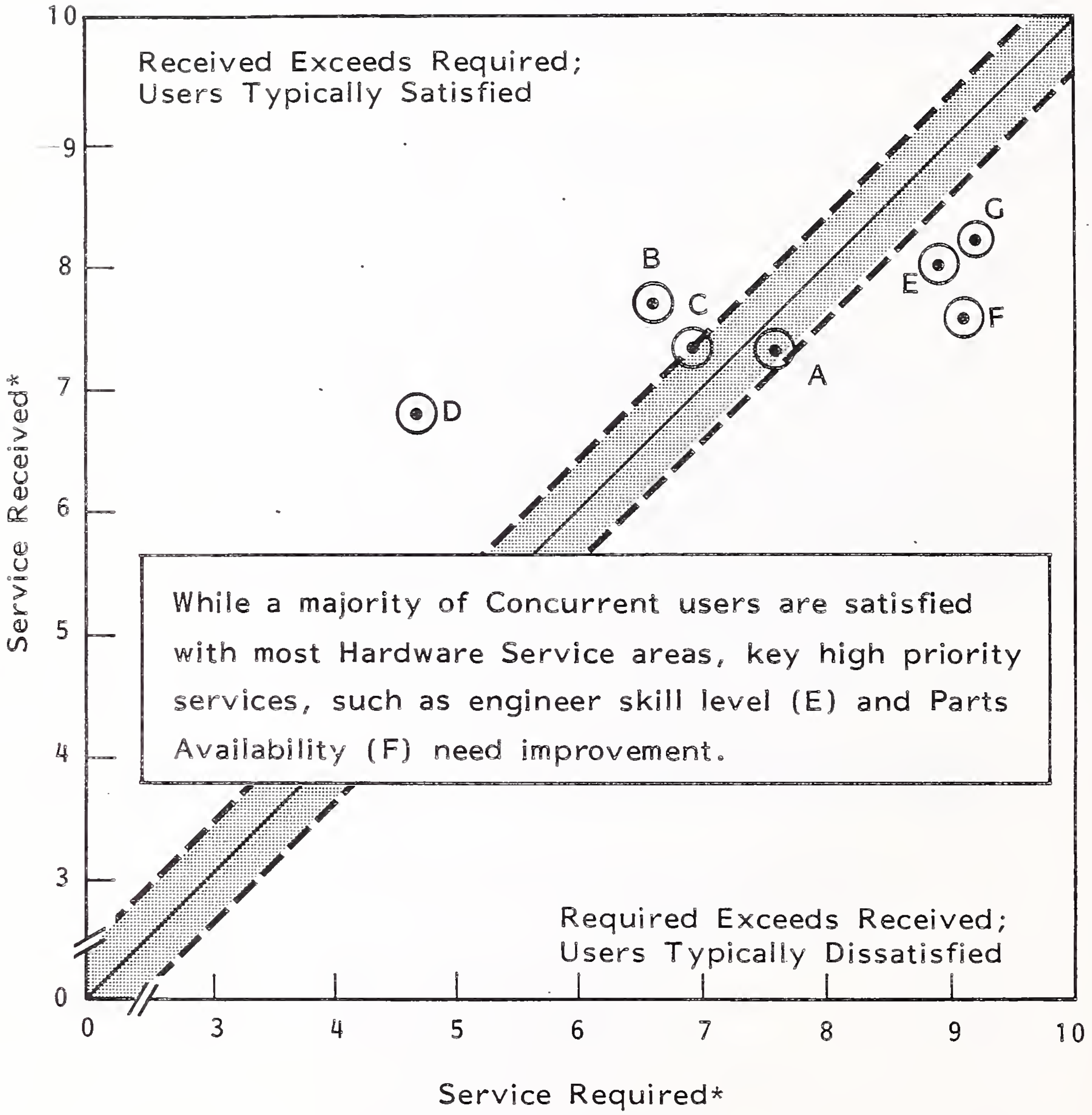
- Concurrent has been much more successful in addressing the rapidly growing service and support requirements of their users in the area of system software support. Although Exhibit III-J-5 shows that users perceived relatively little improvement in the majority of systems software support areas, user satisfaction in virtually all areas comes close to or exceeds user requirements. The exception of note is documentation, which in Exhibit III-J-6 falls below the user requirements. However, Exhibit III-J-7 indicates that even documentation as a service improved in 1986. Concurrent's ability to target and satisfy user requirements in software support should prove critical to the success of the company, due to the growing dependence on increased system availability.

- Exhibit III-J-8 provides a model for properly identifying, measuring, and satisfying the changing requirements of a user base. Note that in each area, Concurrent has provided service to their users at or above the levels required, without exceeding each requirement to such a degree that would suggest a lack of overall focus.

- Exhibit III-J-9 provides the actual numbers associated with measuring service performance. Note that in most areas, actual service performance by Concurrent has improved. System availability has improved both as a result of greater reliability of the 32XX as well as faster total turnaround on hardware and software problem resolution. Exhibit III-J-10 demonstrates that, with the sole exception of software repair time, vendor performance meets or exceeds user requirements.

EXHIBIT III-J-4

HARDWARE SERVICES REQUIRED/RECEIVED
CONCURRENT



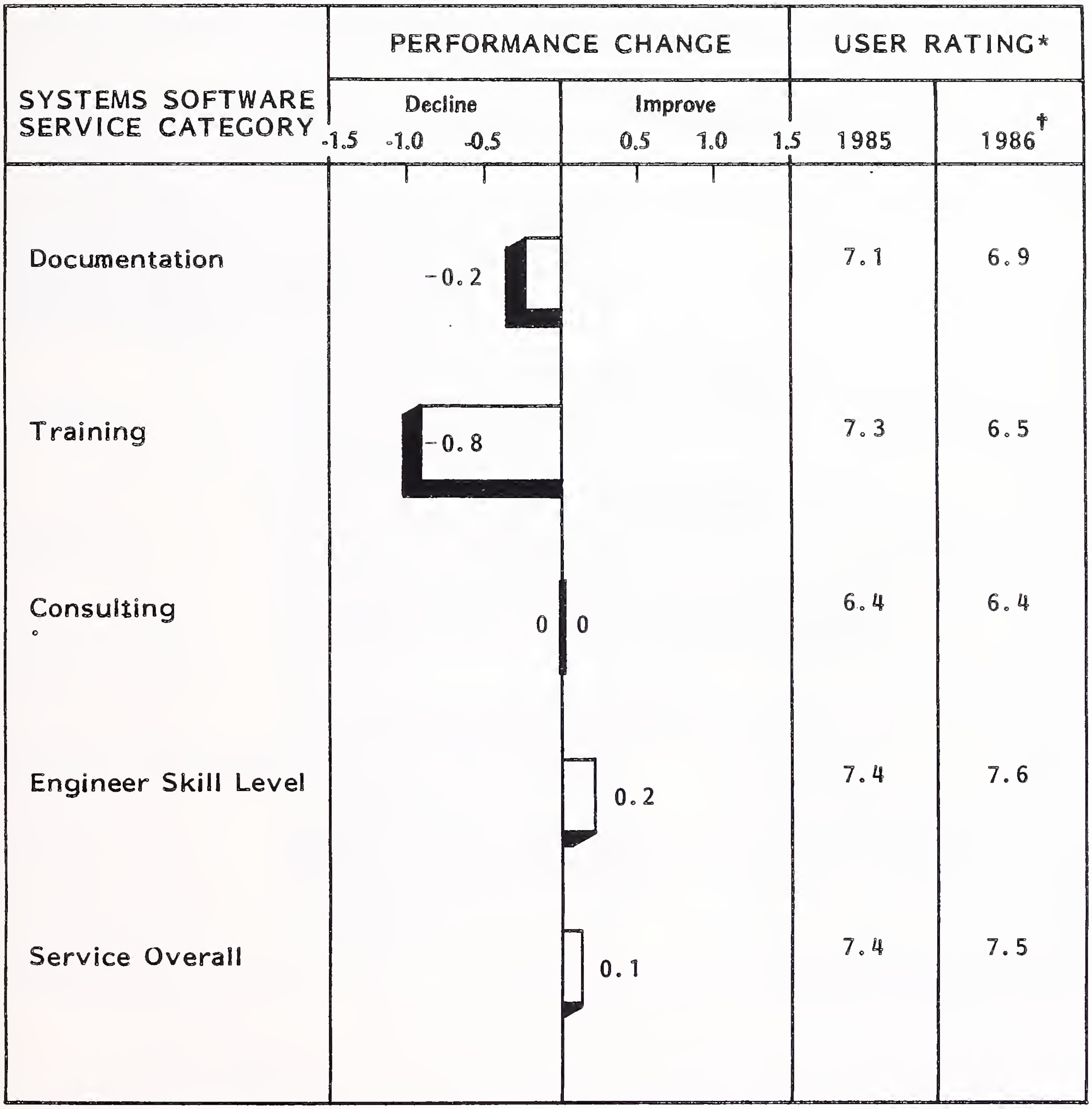
While a majority of Concurrent users are satisfied with most Hardware Service areas, key high priority services, such as engineer skill level (E) and Parts Availability (F) need improvement.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-J-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
CONCURRENT



SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING*	
		1985	1986†
Documentation	-0.2	7.1	6.9
Training	-0.8	7.3	6.5
Consulting	0	6.4	6.4
Engineer Skill Level	0.2	7.4	7.6
Service Overall	0.1	7.4	7.5

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-J-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
CONCURRENT

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	▨ 7.3	▨ 6.9	▨ (0.4)
Training	6.2	6.5	0.3
Consulting	6.4	6.4	0.0
Remote Support	4.3	5.7	1.4
Engineer Skill Level	7.2	7.6	0.4
Service Overall	7.0	7.5	0.5

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-J-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE CONCURRENT

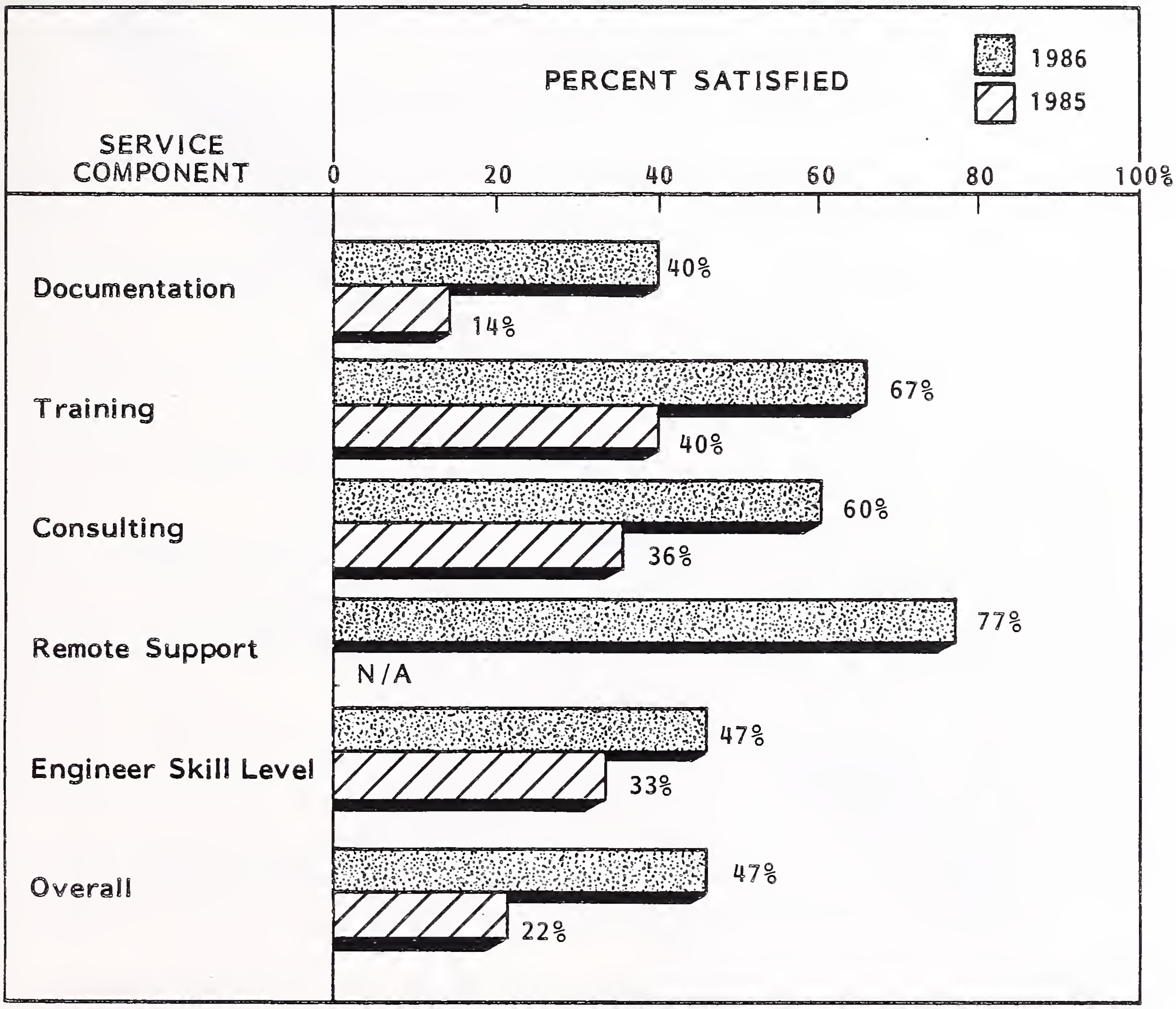
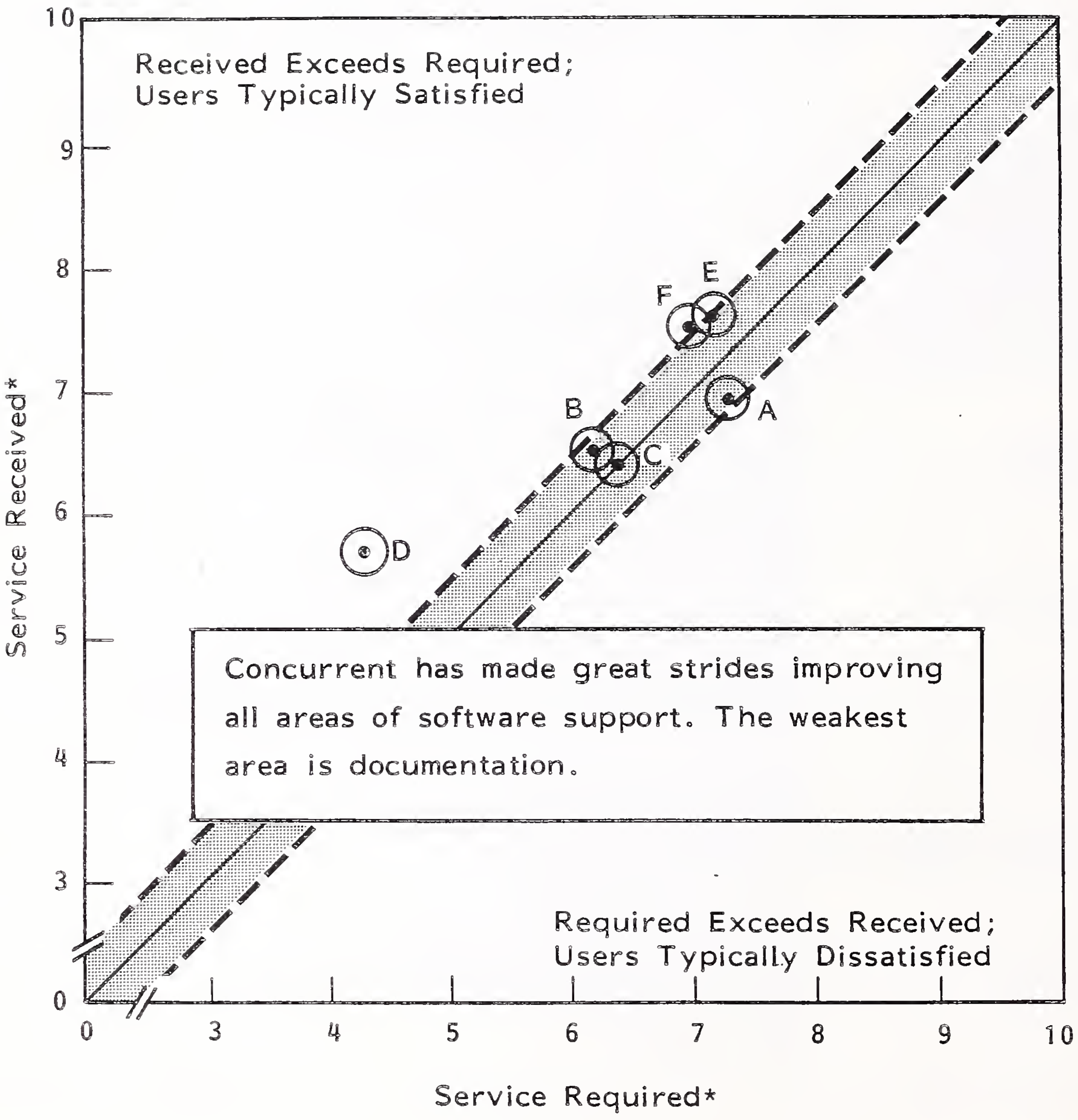


EXHIBIT III-J-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED CONCURRENT



Concurrent has made great strides improving all areas of software support. The weakest area is documentation.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

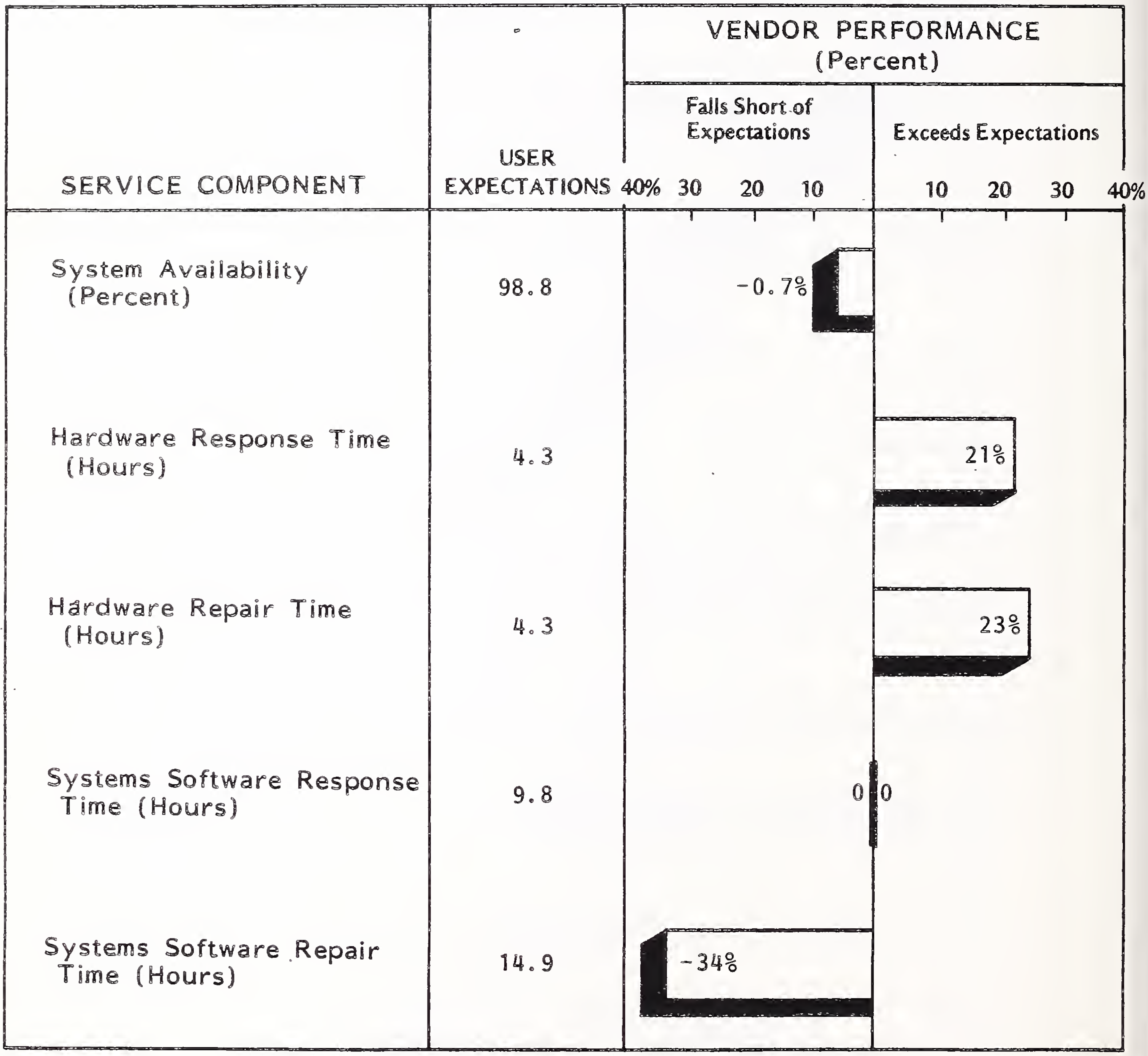
EXHIBIT III-J-9

SERVICE PERFORMANCE
CONCURRENT

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	96.3%	98.1%
Average Number of Interruptions		
Per Month (Number)	4.7	1.0
Percent Hardware Caused	71.0%	54.0%
Percent Software Caused	29.0%	21.0%
Average Hardware Response Time (Hours)	5.6 hr.	3.4 hr.
Average Hardware Repair Time (Hours)	2.6 hr.	3.3 hr.
Average Systems Software Response Time (Hours)	5.6 hr.	9.8 hr.
Average Systems Software Repair Time (Hours)	30.5 hr.	20.0 hr.

EXHIBIT III-J-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE
CONCURRENT



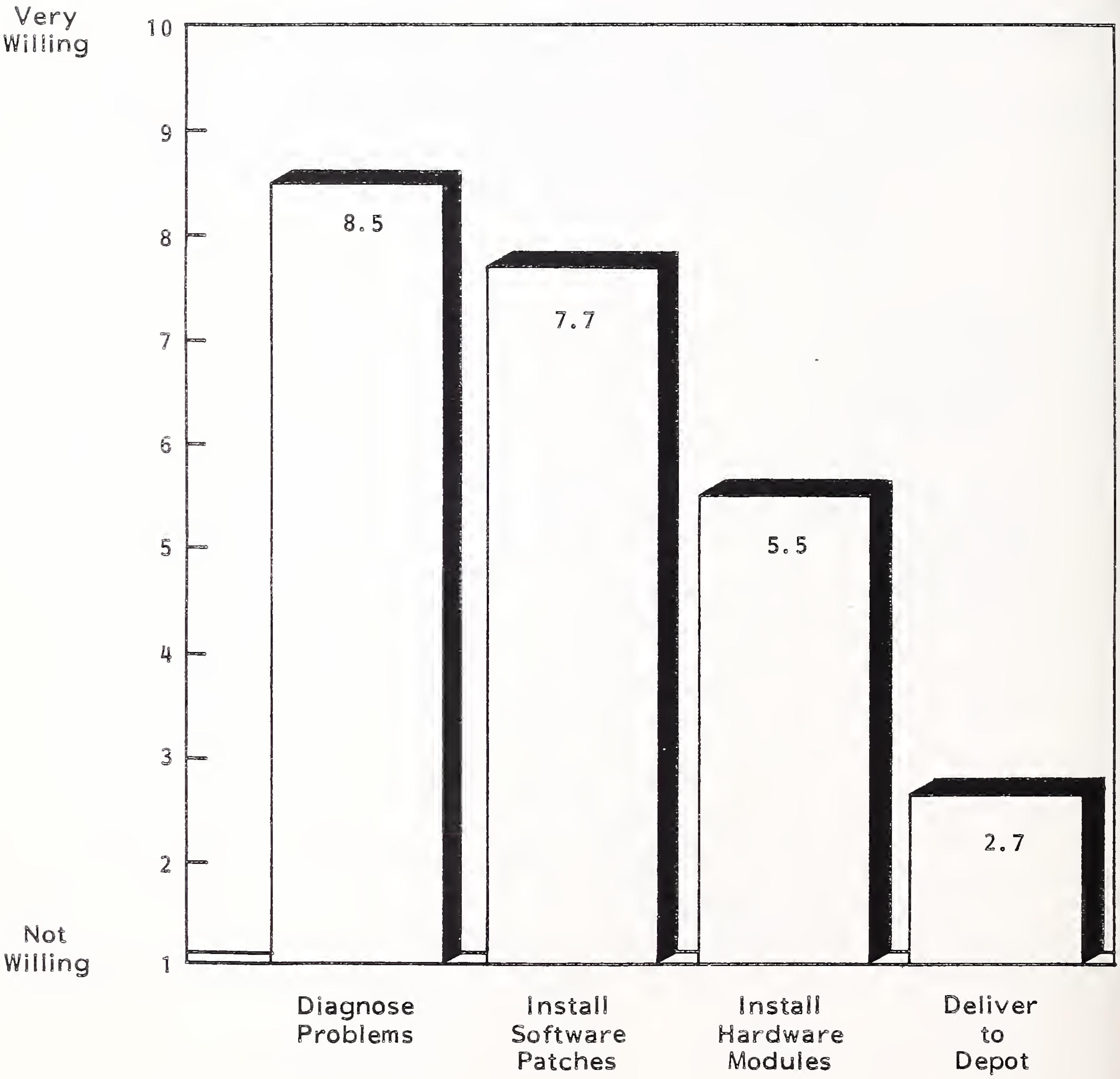
SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent) Falls Short of Expectations	VENDOR PERFORMANCE (Percent) Exceeds Expectations
System Availability (Percent)	98.8	-0.7%	
Hardware Response Time (Hours)	4.3		21%
Hardware Repair Time (Hours)	4.3		23%
Systems Software Response Time (Hours)	9.8	0	0
Systems Software Repair Time (Hours)	14.9	-34%	

- Not surprisingly, Concurrent user satisfaction with service has helped lock these users into Concurrent support. Exhibit III-J-11 suggests that Concurrent users prefer to leave the majority of service activities to Concurrent, and Exhibit III-J-12 shows that the majority of Concurrent users opt for manufacturer service versus third-party maintenance. One should note that INPUT has predicted that superminicomputer maintenance will become a key growth market for TPM, and this exhibit demonstrates that TPM penetration into Concurrent's use base is growing.

- This satisfaction with service has tended to limit user requirement for premium services, as shown in Exhibit III-J-13. While a large number of users reported a requirement for standby coverage, the majority of those users did not report a very high requirement for that service.

EXHIBIT III-J-11

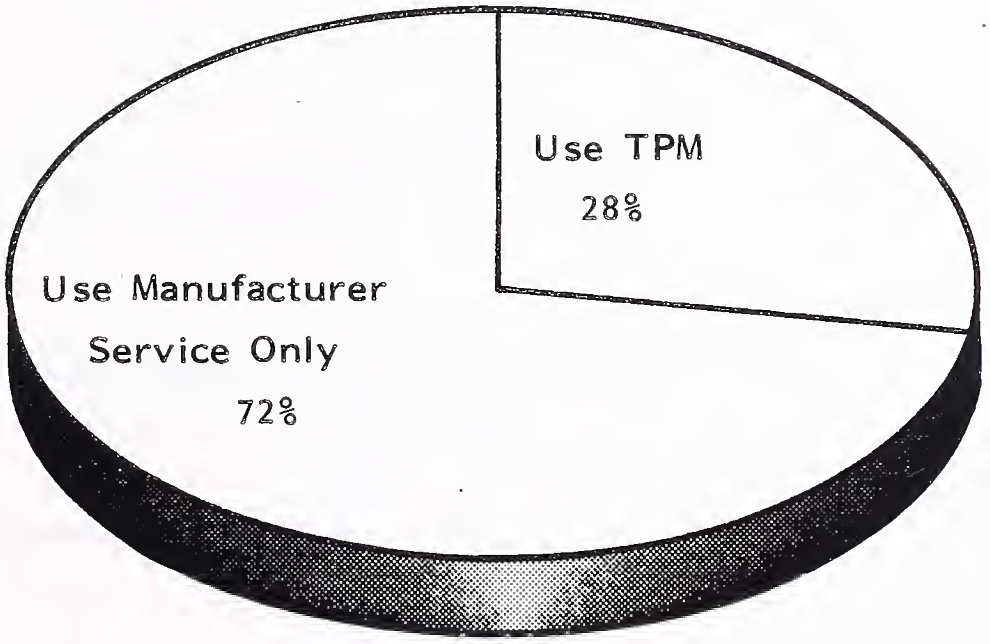
USER WILLINGNESS TO PERFORM MAINTENANCE
CONCURRENT



* Average Standard Error: 0.2

EXHIBIT III-J-12

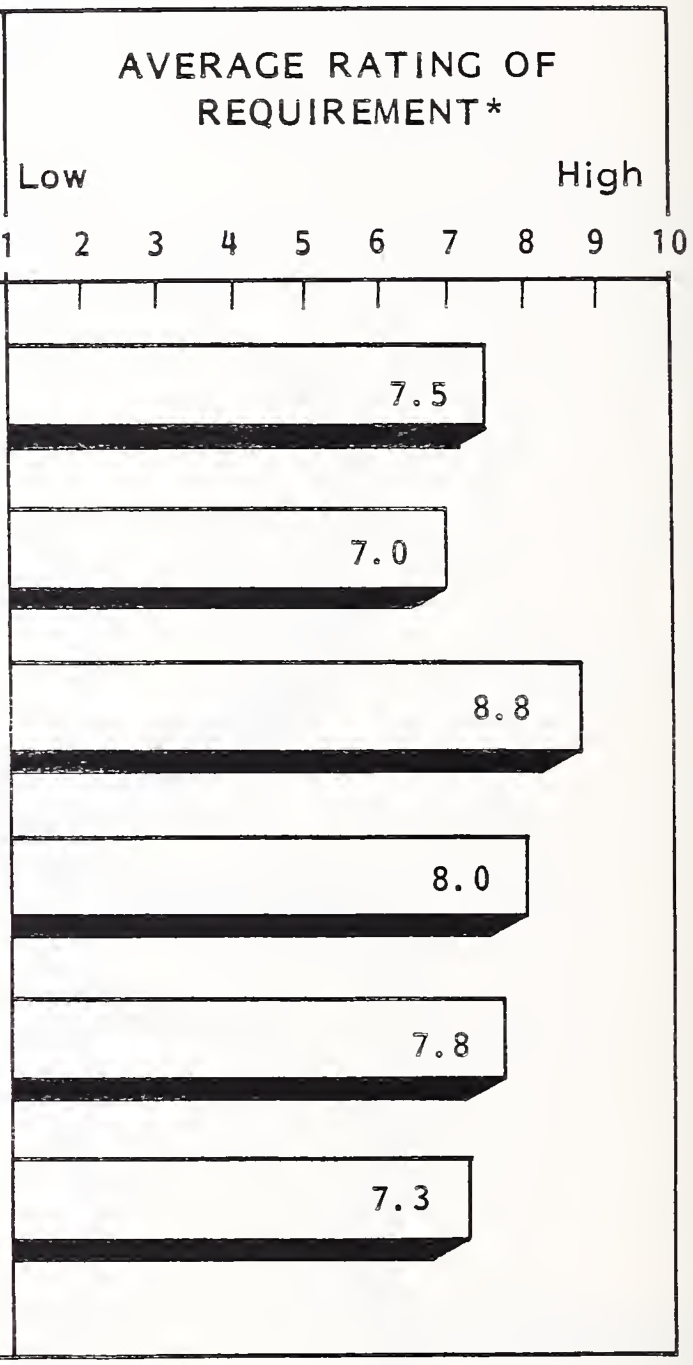
CURRENT TPM USE
CONCURRENT



TPM penetration into Concurrent user sites is limited; however, TPM growth in these sites has increased from 11% in 1985 to 28% in 1986.

EXHIBIT III-J-13

USER REQUIREMENTS FOR EXTENDED SERVICES
CONCURRENT



SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT*
Standby Coverage	44%	7.5
Remote Diagnostics	32	7.0
Preventive Maintenance during Non-Prime Hours	32	8.8
Deferred Response	18	8.0
Under Two-Hour Response	16	7.8
Maintenance Management	24	7.3

*Average Standard Error: 0.6

III K. GOULD

- In April 1986 INPUT interviewed 20 Gould 32XX superminicomputer users concerning their current satisfaction with the level of service and support that they received versus their requirements. All interviews were conducted by telephone, each lasting approximately 20 minutes. INPUT specifically targeted data processing and operations managers for this survey, although a number of the respondents were lead engineers involved in CAD/CAM applications. As with the Concurrent sample, the majority of Gould's users were involved in manufacturing, either in process manufacturing (with 30% of the sample, discrete manufacturing (25%), or services (25%). The remaining four were split between education and the federal government.

- This was the first year that Gould superminicomputer users' service requirements were analyzed, making it impossible to present time-series analyses of their service performance. Exhibit III-K-1 demonstrates that Gould service performance is very similar to that reported by their close competitor--Concurrent Computer Corporation. Users report that they receive higher than required levels of service in the areas of remote support, consulting, and training, and lower than required support in the areas of documentation, FE skill level, spare parts availability, and overall satisfaction with hardware service. Again, the most critical area of concern is of spare parts availability, which satisfies only one-fourth of Gould users, as shown in Exhibit III-K-2. While users of market leader DEC also report unmet service requirements in this key service area, DEC at least comes close to satisfying a majority (48%) of their users' needs. Gould and Concurrent will need to address the spares issue in order to gain ground on DEC.

- Exhibit III-K-3 graphically presents the success that Gould has had in satisfying user requirements in certain areas, such as training and consulting, while missing the mark in such key service areas as FE skill level and (most noticeably) spare parts availability.

EXHIBIT III-K-1

1986 USER HARDWARE SERVICE RATINGS
GOULD

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE[*]		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required[†]	Received[†]	
Documentation	7.1	6.9	(0.2)
Training	4.6	6.0	1.4
Consulting	5.4	5.9	0.5
Remote Support	4.0	7.3	3.3
Engineer Skill Level	8.5	7.7	(0.8)
Parts Availability	9.0	7.2	(1.8)
Hardware Service Overall	8.5	7.5	(1.0)

▨ User Expectation Exceeds Vendor Performance

[*] Rating: 1 = Low, 10 = High

[†] Average Standard Error: 0.4

EXHIBIT III-K-2

USER SATISFACTION: HARDWARE SERVICE
GOULD

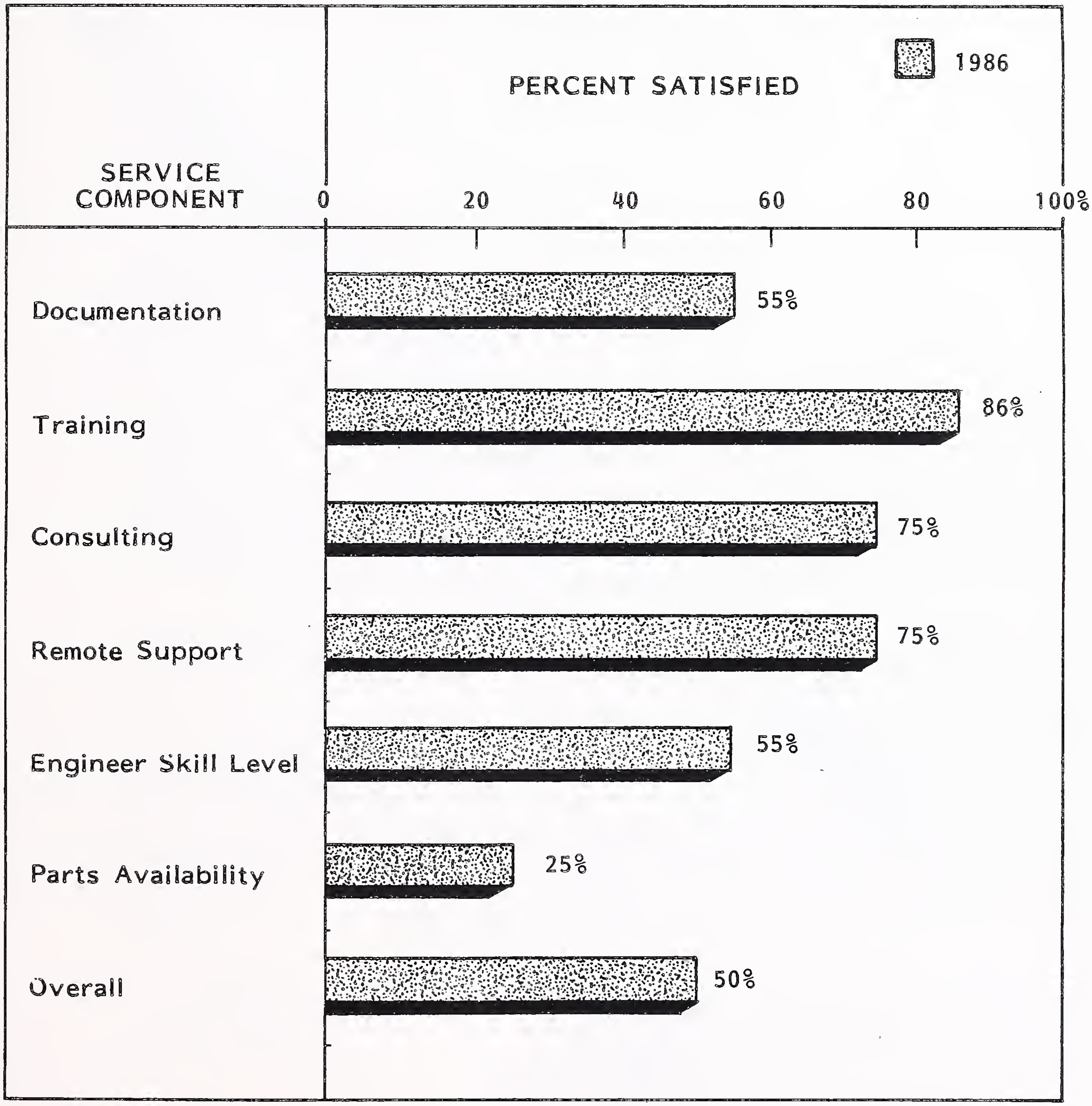
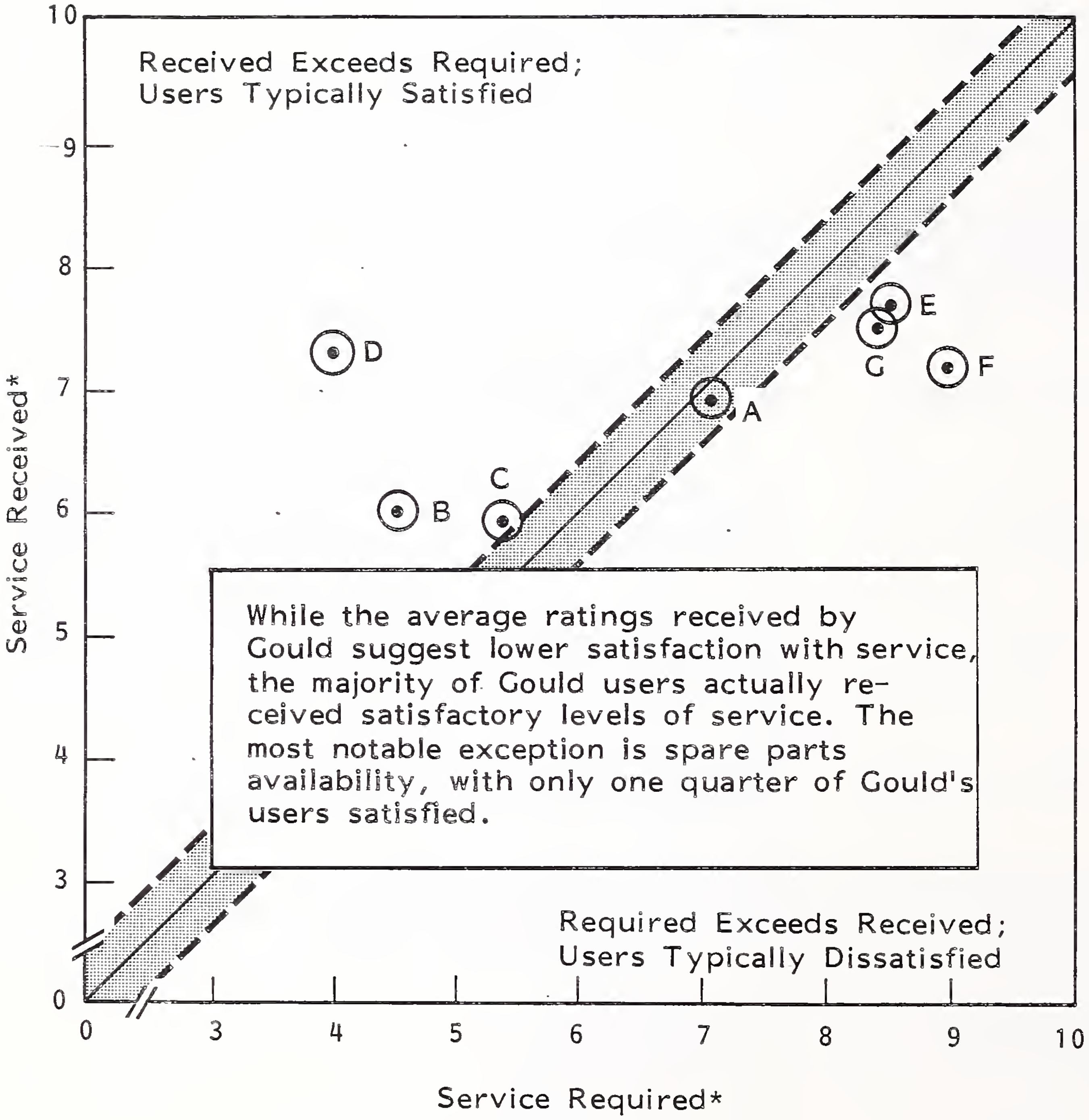


EXHIBIT III-K-3

HARDWARE SERVICES REQUIRED/RECEIVED
GOULD



While the average ratings received by Gould suggest lower satisfaction with service, the majority of Gould users actually received satisfactory levels of service. The most notable exception is spare parts availability, with only one quarter of Gould's users satisfied.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

- Exhibit III-K-4 shows that Gould also excells in the areas of consulting and remote support for systems software. An area of immediate concern should be systems software documentation, which falls well below user requirements. In fact, Exhibit III-K-5 indicates that only 20% of Gould users are satisfied with their systems software documentation. Undoubtedly, this dissatisfaction with documentation contributes to the rather low percentage of users who are satisfied with their systems software support overall. The importance of documentation cannot be overemphasized, since INPUT has found that 60% of all software problems are user related. Exhibit III-K-6 graphically demonstrates the distance between user needs and actual vendor performance in systems software documentation.

- Exhibit III-K-7 presents the actual performance marks traditionally used to judge service performance. When viewed in correlation with Exhibit III-K-8, it is obvious that Gould does an admirable job in meeting the high system availability requirements of their users. Gould exceeds the hardware response and repair time requirements of their users, and comes close to the systems software response and repair time requirements. This tends to highlight the growing concern which users are placing on spare parts availability, since it appears that the FE is arriving quickly enough, just not with the correct part.

- Exhibit III-K-9 suggests that Gould users are very willing to increase their involvement in problem determination. In many situations, this indicates a user desire to reduce their service costs. In this case, however, user willingness indicates a desire to become more involved in fault diagnosis, with the possible goal of improving the chances of the FE having the correct spare part at hand before being dispatched. In this case, the increased willingness of the user to become involved can be used by the vendor to improve service satisfaction.

- Exhibit III-K-10 indicates that almost one-third of Gould's users are experienced with third-party maintenance. Since this is the first year that Gould

EXHIBIT III-K-4

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
GOULD

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	8.3	5.8	(2.5)
Training	6.4	6.2	(0.2)
Consulting	5.5	6.1	0.6
Remote Support	3.6	6.7	3.1
Engineer Skill Level	7.9	7.2	(0.7)
Service Overall	7.7	6.4	(1.3)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.6

EXHIBIT III-K-5

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
GOULD

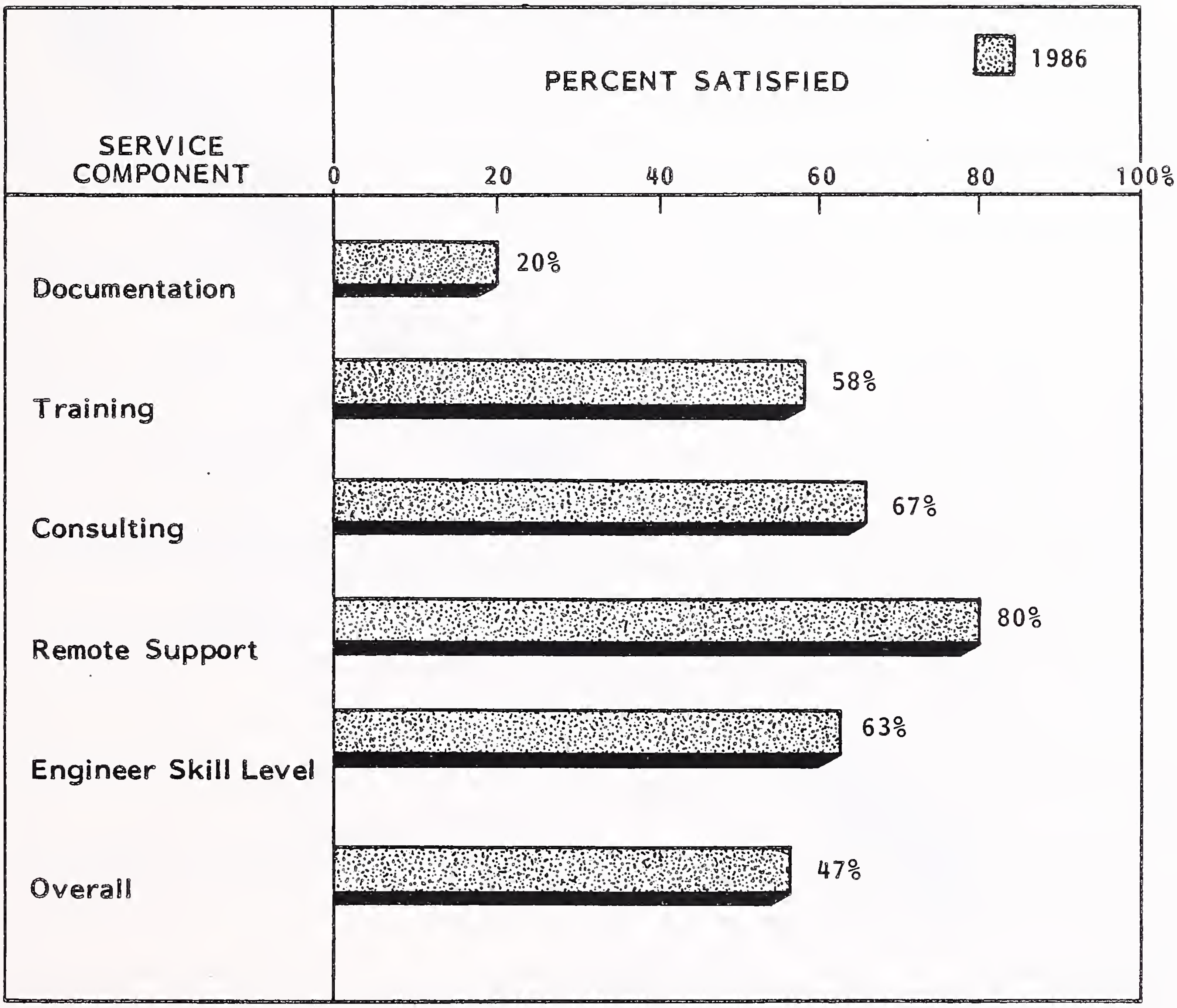
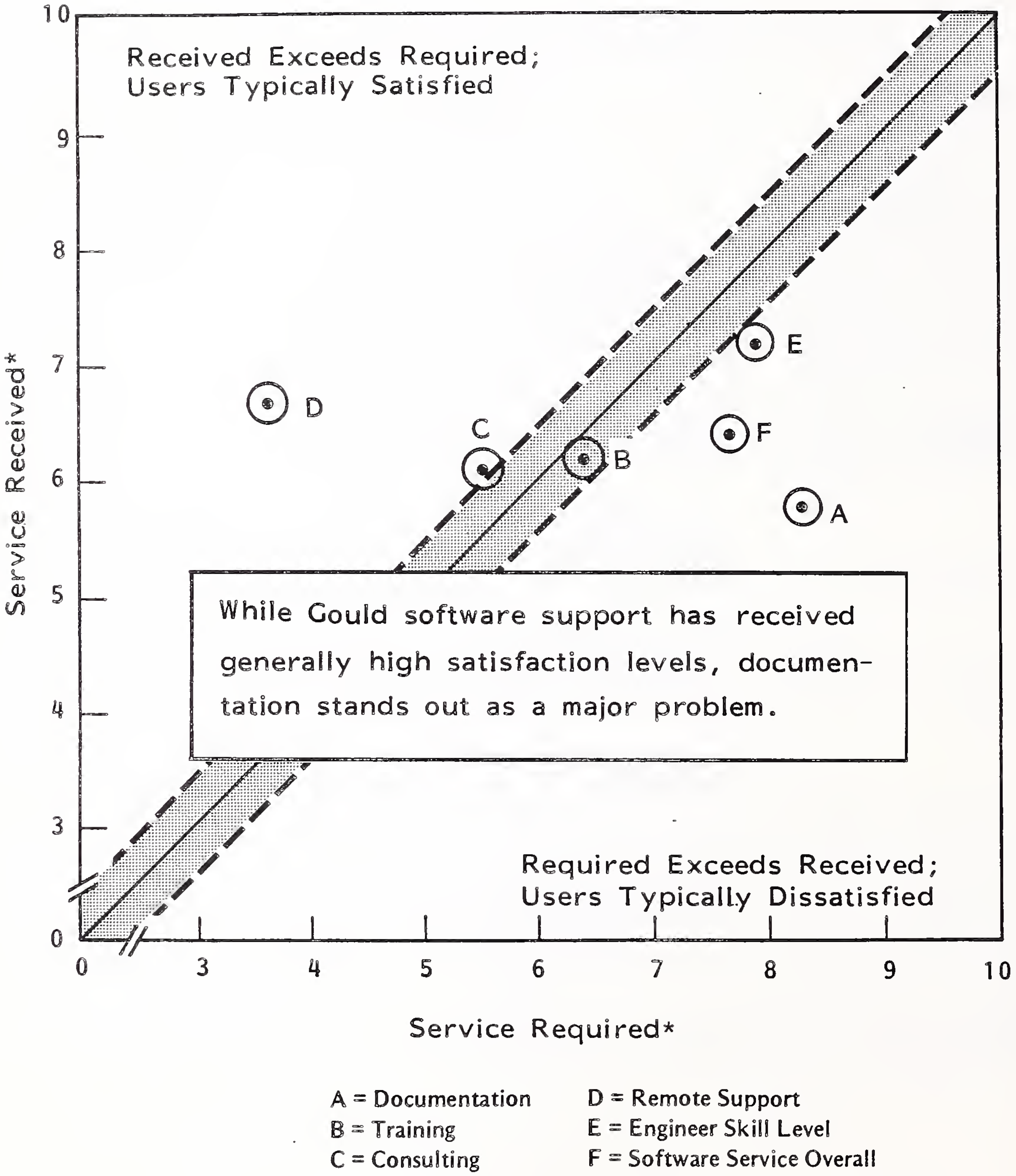


EXHIBIT III-K-6

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
GOULD



While Gould software support has received generally high satisfaction levels, documentation stands out as a major problem.

* Rating: 1 = Low, 10 = High

EXHIBIT III-K-7

SERVICE PERFORMANCE
GOULD

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	N/A	98.0%
Average Number of Interruptions		
Per Month (Number)	N/A	1.3
Percent Hardware Caused	N/A	52.0%
Percent Software Caused	N/A	30.0%
Average Hardware Response Time (Hours)	N/A	5.1 hr.
Average Hardware Repair Time (Hours)	N/A	5.7 hr.
Average Systems Software Response Time (Hours)	N/A	9.9 hr.
Average Systems Software Repair Time (Hours)	N/A	11.1 hr.

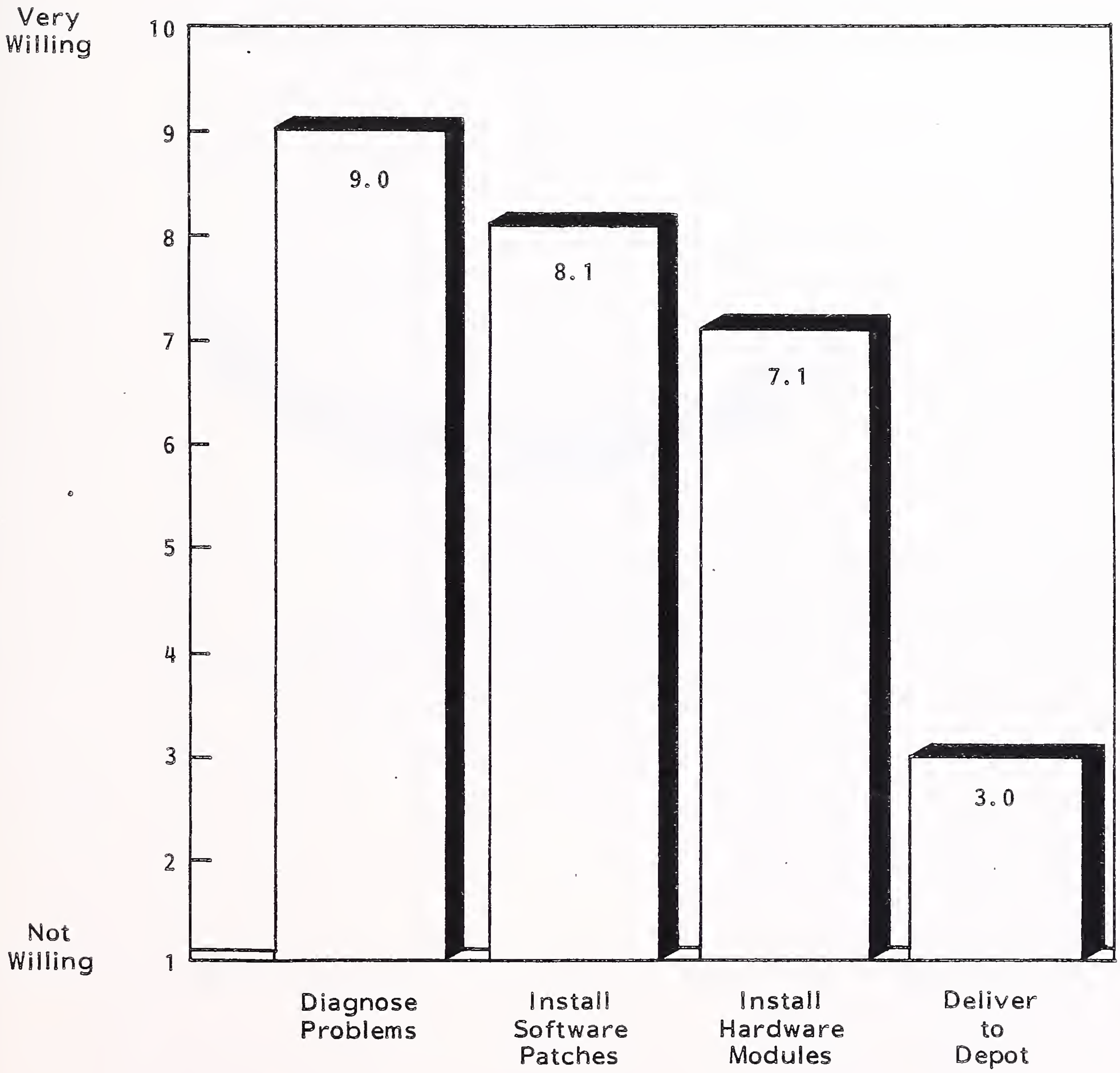
EXHIBIT III-K-8

USER EXPECTATIONS FOR SERVICE PERFORMANCE
GOULD

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent) Falls Short of Expectations	
			Exceeds Expectations
System Availability (Percent)	97.5		1%
Hardware Response Time (Hours)	8.0		36%
Hardware Repair Time (Hours)	6.6		14%
Systems Software Response Time (Hours)	9.9	0	0
Systems Software Repair Time (Hours)	11.8	6%	

EXHIBIT III-K-9

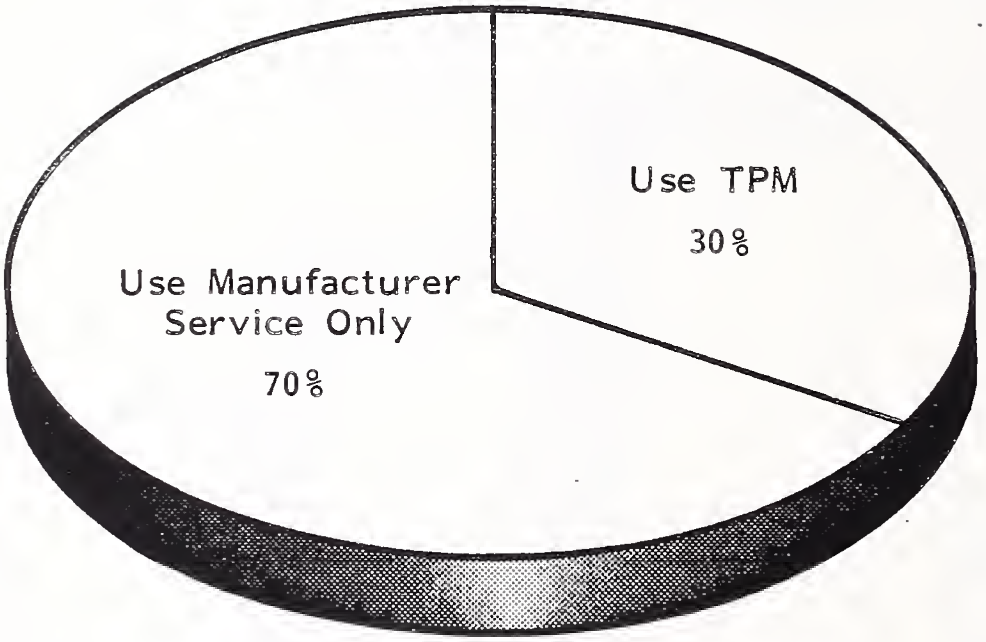
USER WILLINGNESS TO PERFORM MAINTENANCE
GOULD



* Average Standard Error: 0.2

EXHIBIT III-K-10

CURRENT TPM USE
GOULD



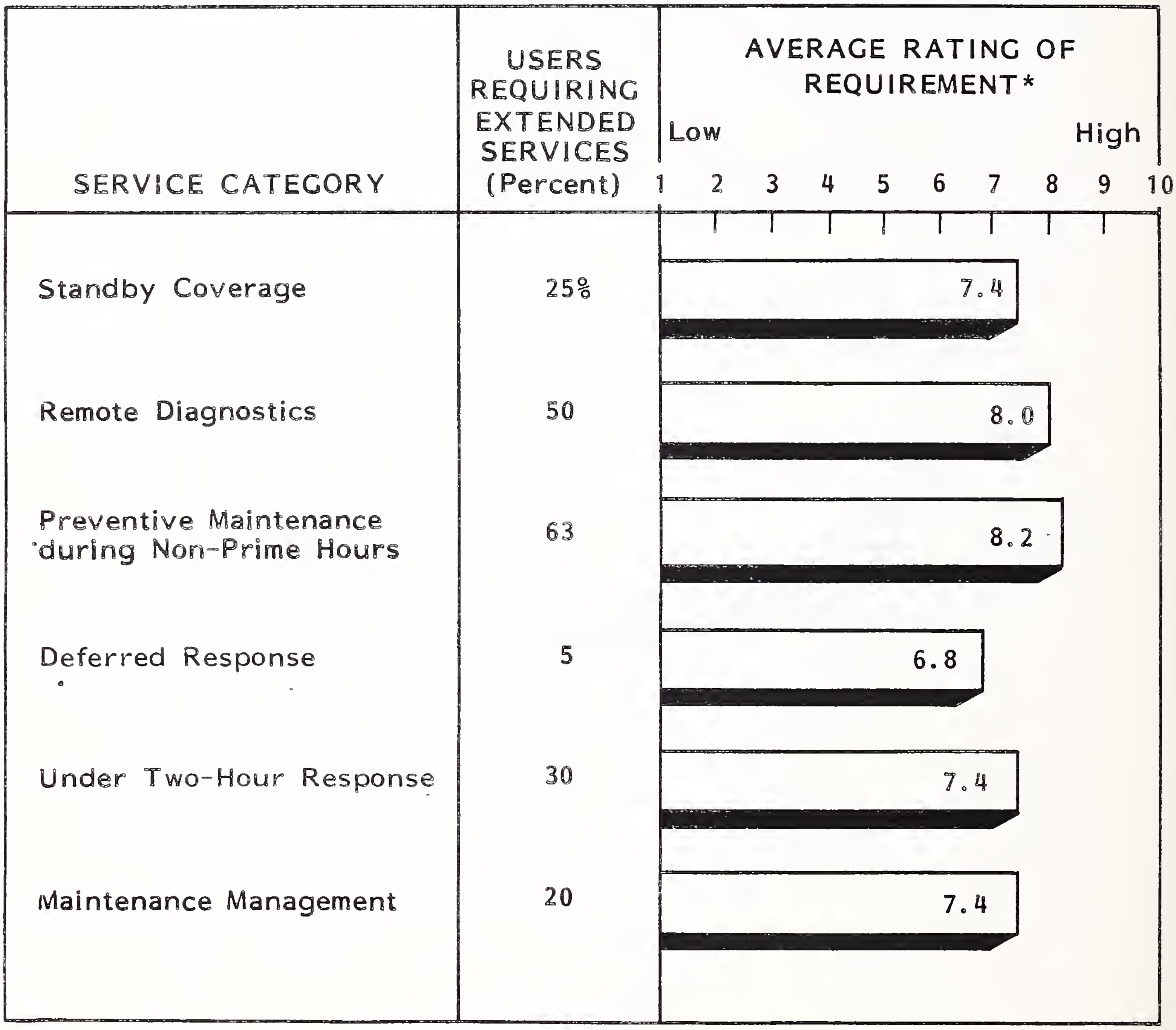
Almost one-third of all current Gould Super-mini computer users are experienced with third-party maintenance companies.

users were surveyed, it is not possible to gauge whether TPM encroachment is increasing. However, it is safe to project that TPM penetration into the superminicomputer market is growing and that Gould, as a vendor in that market, is not immune.

- Exhibit III-K-11 suggests that Gould superminicomputer users are not attracted to premium services, with the exception of non-prime hours preventive maintenance visits. Gould users recognized the importance of PM visits in preventing downtime, and thus were attracted to these additional visits as a way of maintaining high levels of system availability.

EXHIBIT III-K-11

USER REQUIREMENTS FOR EXTENDED SERVICES
GOULD



SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT*
Standby Coverage	25%	7.4
Remote Diagnostics	50	8.0
Preventive Maintenance during Non-Prime Hours	63	8.2
Deferred Response	5	6.8
Under Two-Hour Response	30	7.4
Maintenance Management	20	7.4

*Average Standard Error: 0.4

III L. IBM

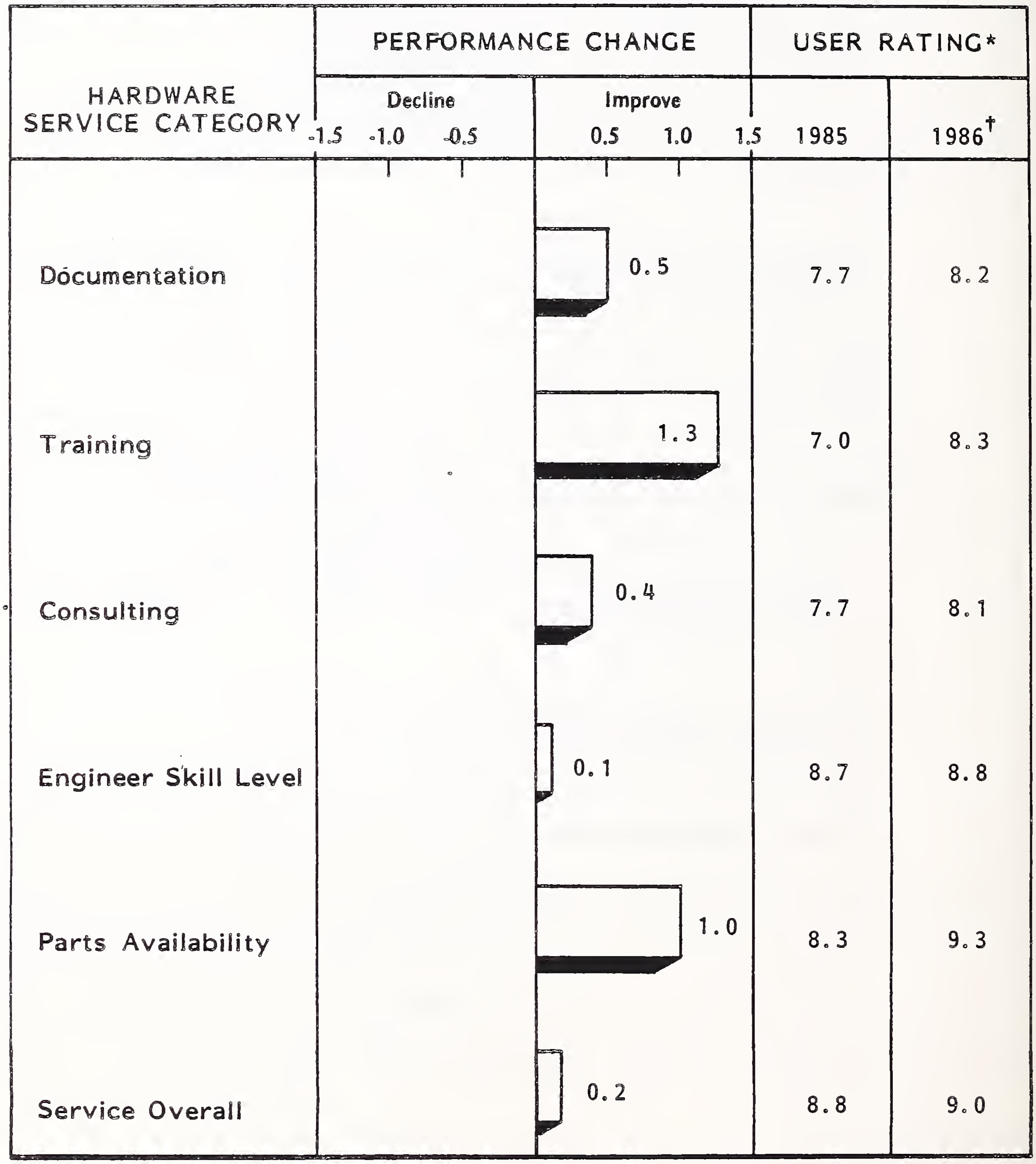
- In April 1986 INPUT interviewed 25 IBM System 38 users regarding their satisfaction with the level of hardware maintenance and system software support that they received from IBM. All interviews were performed by telephone, each lasting approximately 20 minutes. Respondents were typically data processing or computer operations managers. Other than process manufacturers, which constituted 36% of the respondent base, the IBM superminicomputer sample was evenly dispersed across industry boundaries.

- Exhibit III-L-1 demonstrates that IBM has improved their already high System 38 user hardware service ratings in 1986. More significantly, IBM exceeds their users' requirement levels in virtually all hardware service areas, as shown in Exhibit III-L-2. Even in the critical areas of FE skill level--spare parts availability and overall satisfaction--IBM meets their users' high requirements (note that the standard error of the mean covers what little distance exists between user requirements and received levels for parts and overall satisfaction). Not surprisingly, IBM succeeds in satisfying the vast majority of their users' service needs for all the hardware service components tested in Exhibit III-L-3.

- IBM benefits from a reputation for service and support of their users, which has helped build the user perception of excellent service, even though actual service provided might not be that far superior to the industry norm. Where IBM has been especially successful is in their ability to identify the current needs of their users and then provide services that address those needs. And, rather than concentrating on one or two specific areas which might result in lapses in other areas, IBM has demonstrated the ability to provide the correct amount of support in all service areas. Note that in Exhibit III-L-4, IBM users place most of their satisfaction ratings above, yet relatively close to the diagonal line representing their needs. More importantly, as the service

EXHIBIT III-L-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
IBM



HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING*	
	Decline -1.5 -1.0 -0.5 / Improve 0.5 1.0 1.5	1985	1986†
Documentation	0.5	7.7	8.2
Training	1.3	7.0	8.3
Consulting	0.4	7.7	8.1
Engineer Skill Level	0.1	8.7	8.8
Parts Availability	1.0	8.3	9.3
Service Overall	0.2	8.8	9.0

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-L-2

1986 USER HARDWARE SERVICE RATINGS
IBM

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	6.4	8.3	1.9
Training	6.6	8.3	1.7
Consulting	6.3	8.1	1.8
Remote Support	5.2	7.3	2.1
Engineer Skill Level	8.6	8.8	0.2
Parts Availability	▨ 9.5	▨ 9.3	▨ (0.2)
Hardware Service Overall	▨ 9.2	▨ 9.0	▨ (0.2)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-L-3

USER SATISFACTION: HARDWARE SERVICE
IBM

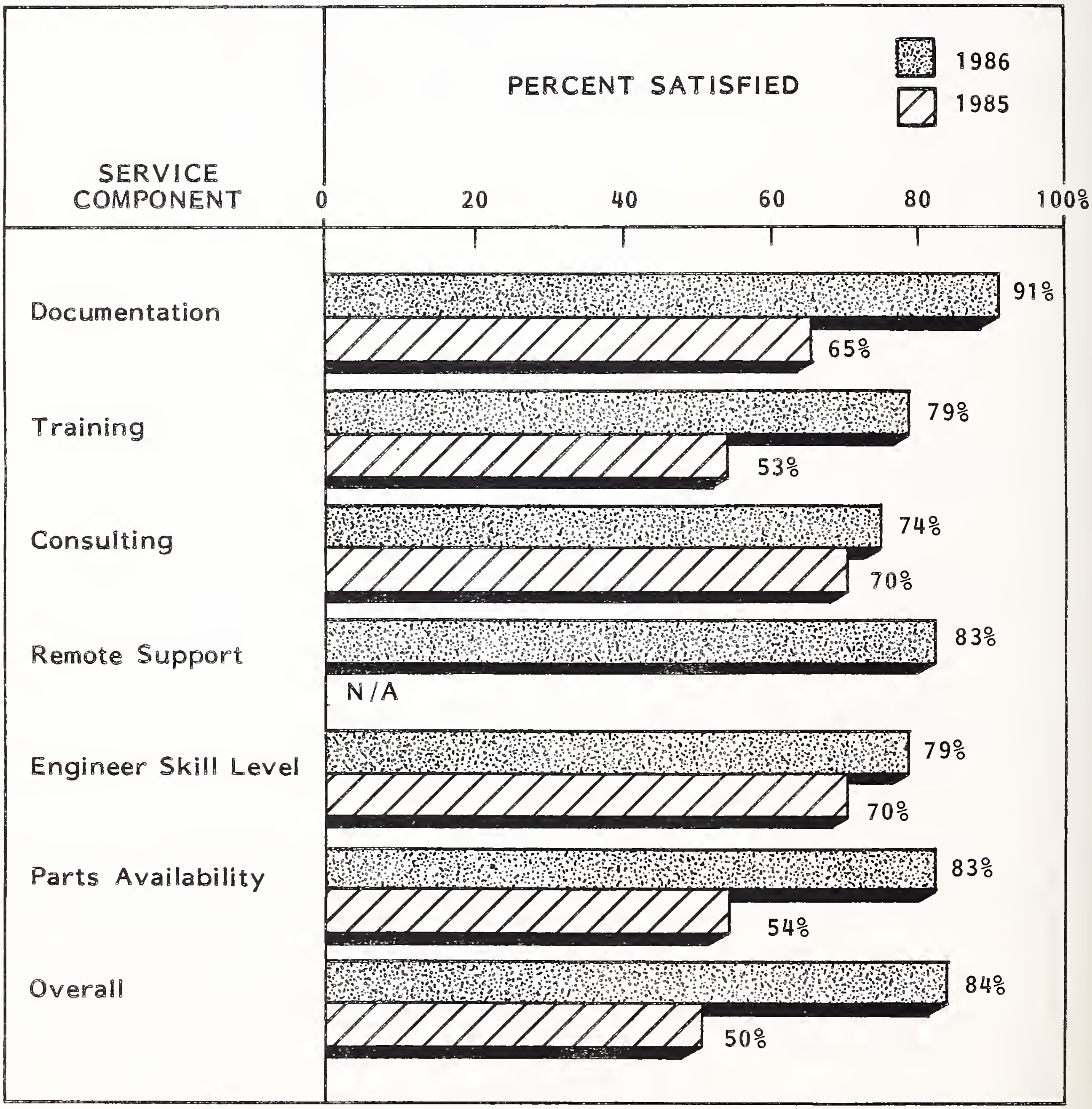
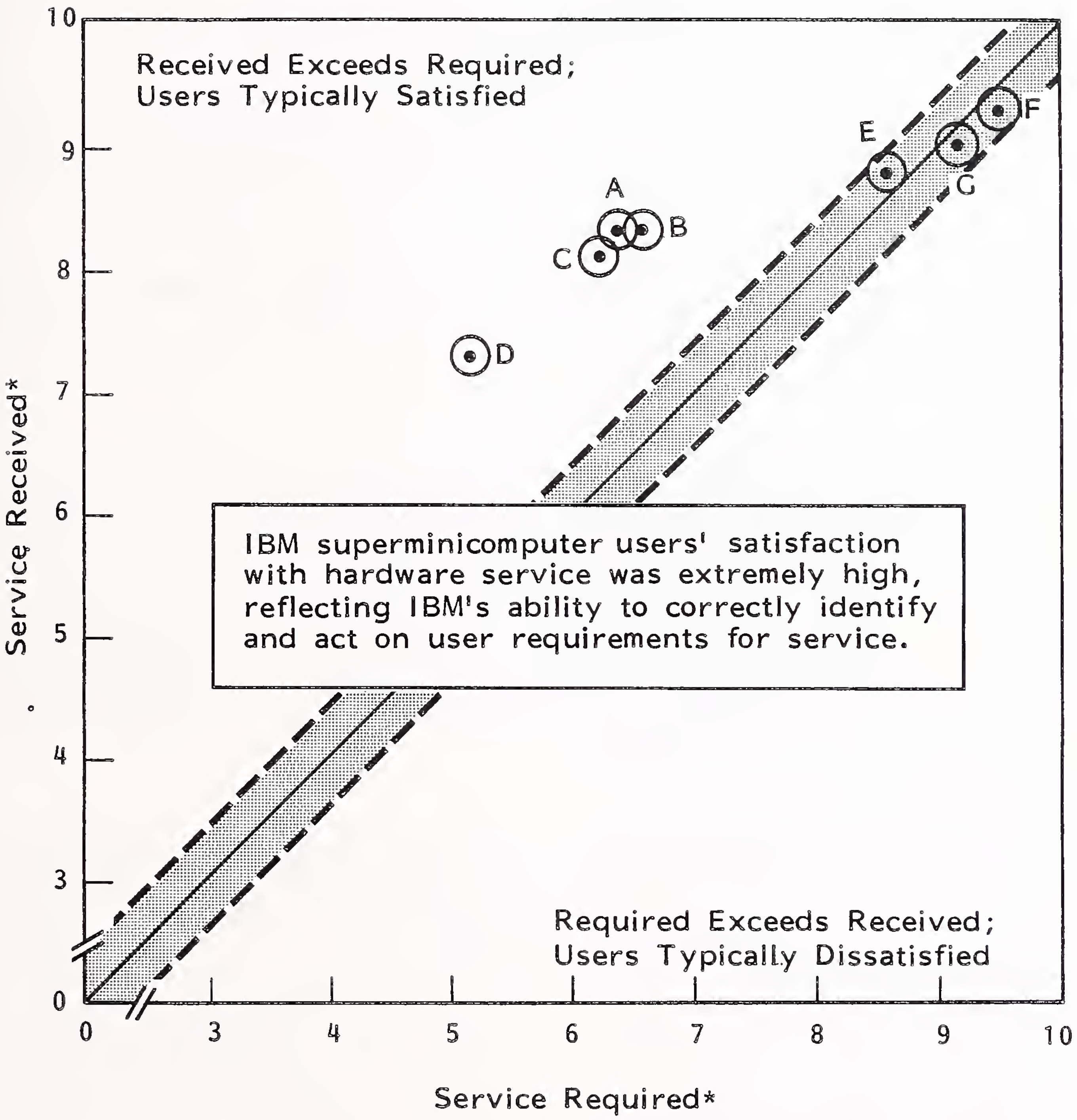


EXHIBIT III-L-4

HARDWARE SERVICES REQUIRED/RECEIVED
IBM



IBM superminicomputer users' satisfaction with hardware service was extremely high, reflecting IBM's ability to correctly identify and act on user requirements for service.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

becomes more important to the user, and coincidentally more expensive to satisfy, IBM's ratings come even closer to that line.

- IBM System 38 service also shines in the area of systems software support. Exhibit III-L-5 shows that IBM users perceived a significant improvement in all components of software support, most notably in the area of engineer skill level, which was a weak spot last year. IBM's ability to target user requirement levels is no better illustrated than in Exhibits II-L-6 and III-L-7, which indicate that IBM is virtually dead on the mark for each service component. This is especially critical considering the rapidly increasing software support requirements that are associated with the superminicomputer market. Again, it is not surprising that the majority of IBM System 38 users report that they are satisfied with all systems software support components tested, as shown in Exhibit III-L-8.

- Exhibit III-L-9 demonstrates that IBM's actual performance is somewhat similar to industry (in this case, the superminicomputer market) standards, if not even below in certain areas. For example, the System 38's availability is below that of competitors DEC, Gould, Concurrent, Data General, and Hewlett-Packard, yet user satisfaction with system availability is very high. Response time for both hardware and software is very good, yet repair times are ordinary at best.

- The key to user satisfaction with service at IBM is that IBM successfully gauges the exact level of service necessary and supplies that level to their users. Exhibit III-L-10 shows that IBM meets or exceeds each component's user service requirement level. As a result, IBM user satisfaction in all service areas continues to remain high, even though other vendors may provide better service in one area or another. Best of all, IBM satisfies the majority of their users with little or no wasted effort (or resources).

- Not surprisingly, IBM users show little interest in increasing their own involvement in maintenance activities, as shown in Exhibit III-L-11. Further-

EXHIBIT III-L-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
IBM

SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE		USER RATING*	
	Decline -2.0 -1.5 -1.0	Improve 1.0 1.5 2.0	1985	1986†
Documentation		0.4	7.8	8.2
Training		1.4	6.8	8.2
Consulting		1.0	7.3	8.3
Engineer Skill Level		1.7	7.0	8.7
Service Overall		1.0	7.4	8.4

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.3

EXHIBIT III-L-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
IBM

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	8.2	8.2	0.0
Training	8.2	8.2	0.0
Consulting	7.5	8.3	0.8
Remote Support	6.4	6.5	0.1
Engineer Skill Level	▨ 9.3	▨ 8.7	▨ (0.6)
Service Overall	▨ 9.1	▨ 8.4	▨ (0.7)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-L-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE

IBM

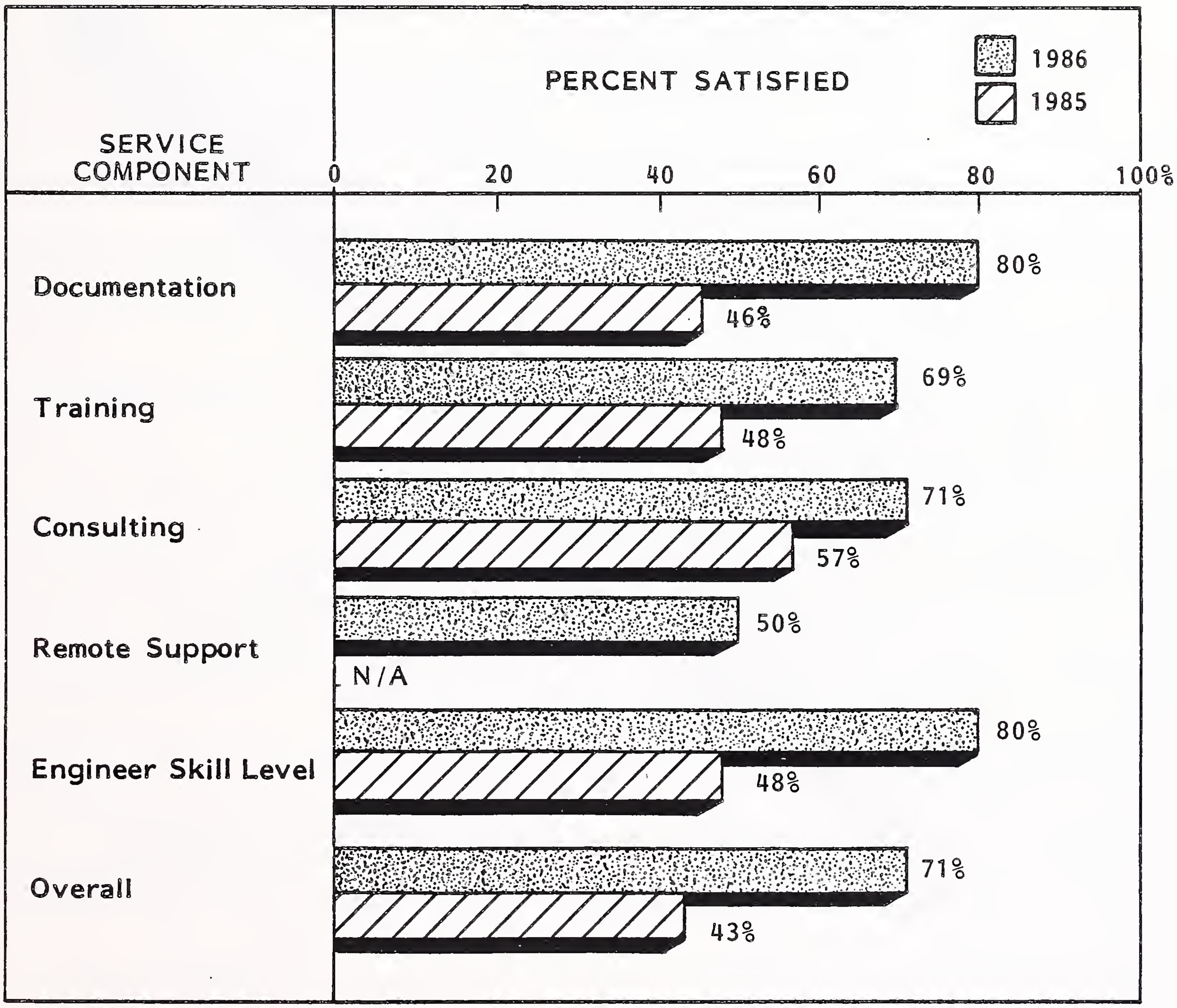
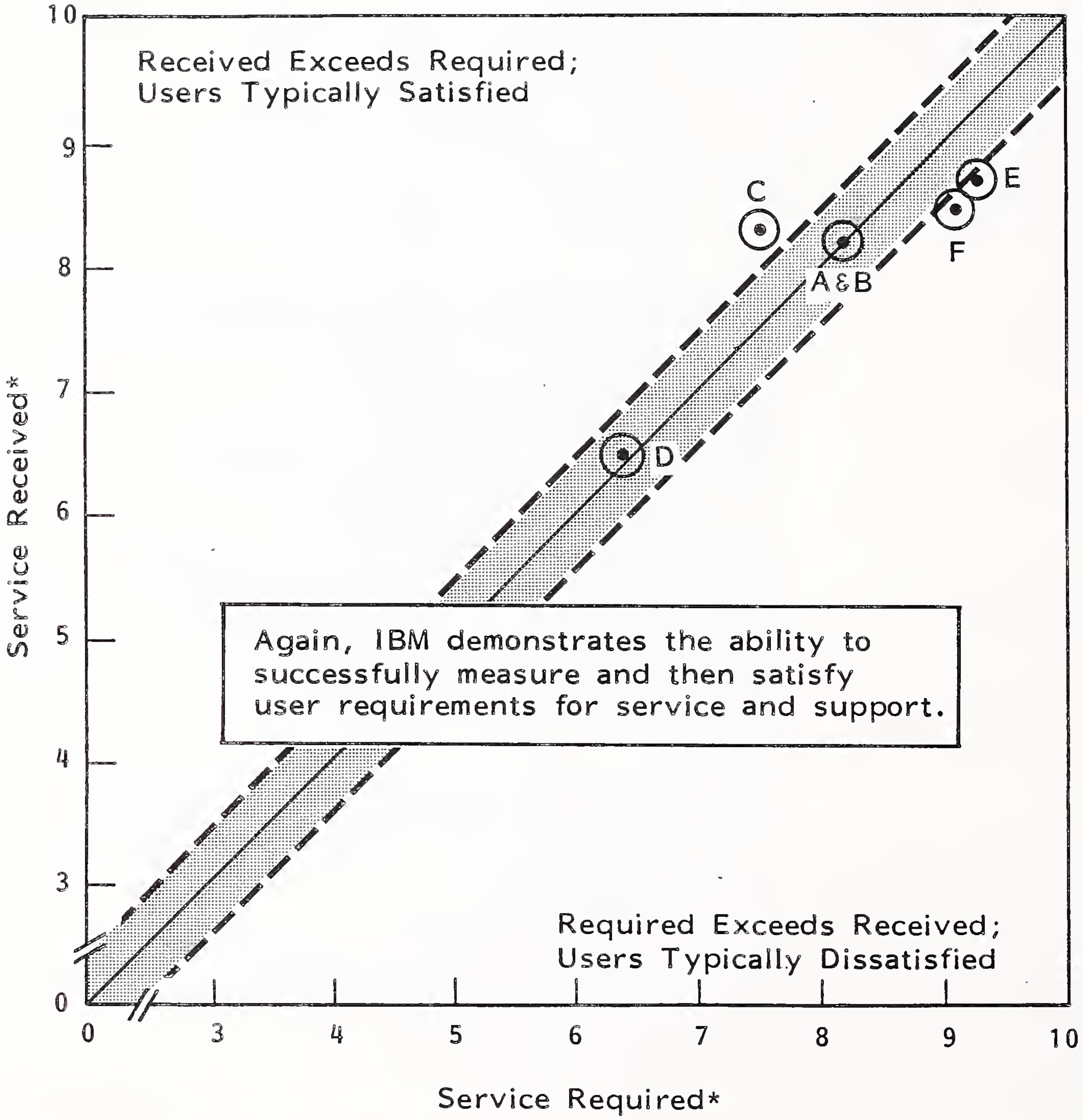


EXHIBIT III-L-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED

IBM



Again, IBM demonstrates the ability to successfully measure and then satisfy user requirements for service and support.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-L-9

SERVICE PERFORMANCE
IBM

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	97.3%	96.8%
Average Number of Interruptions		
Per Month (Number)	0.7	0.5
Percent Hardware Caused	55.0%	67.0%
Percent Software Caused	15.0%	7.0%
Average Hardware Response Time (Hours)	1.4 hr.	1.8 hr.
Average Hardware Repair Time (Hours)	2.9 hr.	4.4 hr.
Average Systems Software Response Time (Hours)	6.2 hr.	3.2 hr.
Average Systems Software Repair Time (Hours)	9.4 hr.	12.6 hr.

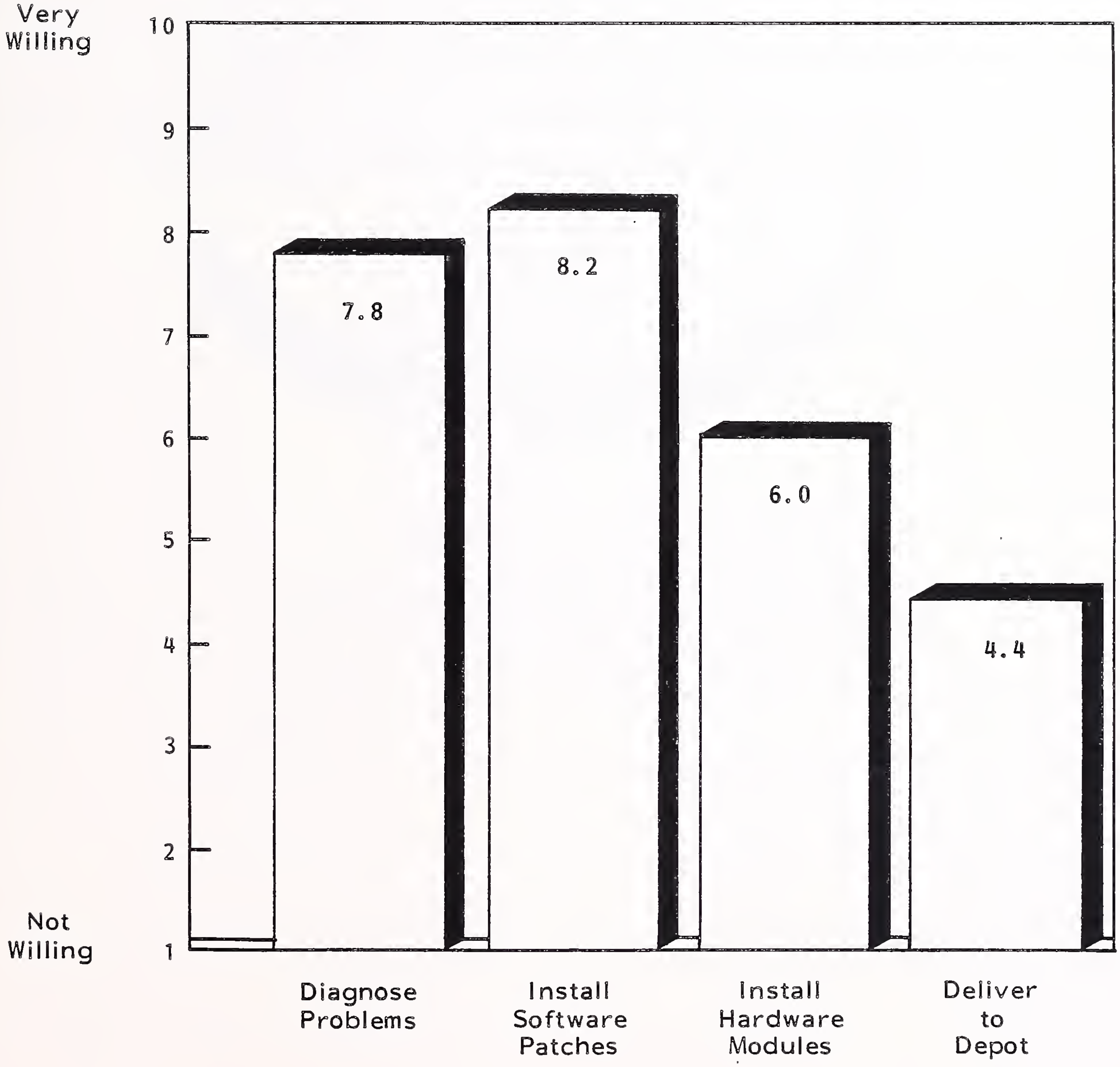
EXHIBIT III-L-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE
IBM

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent) Falls Short of Expectations 40% 30 20 10	VENDOR PERFORMANCE (Percent) Exceeds Expectations 10 20 30 40%
System Availability (Percent)	95.1		2%
Hardware Response Time (Hours)	1.3	0	0
Hardware Repair Time (Hours)	6.7		34%
Systems Software Response Time (Hours)	5.4		40%
Systems Software Repair Time (Hours)	12.2	-3%	

EXHIBIT III-L-11

USER WILLINGNESS TO PERFORM MAINTENANCE
IBM



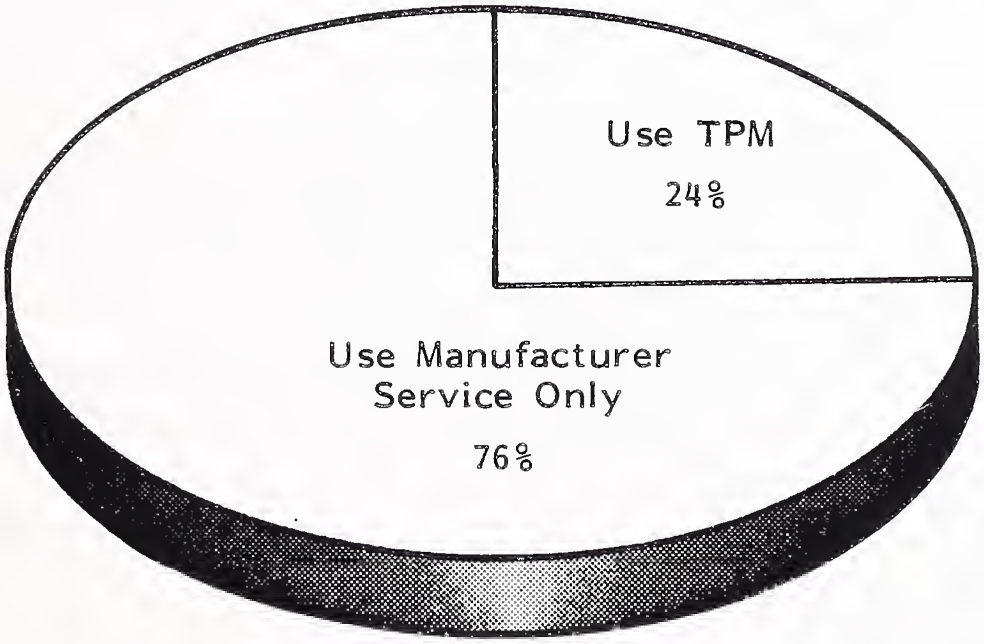
* Average Standard Error: 0.3

more, Exhibit III-L-12 suggests that IBM has been very successful in keeping users drawn to IBM service, even though the installed base of System 38 users must be large enough to attract TPM competition. The key to IBM's success is IBM's ability to target and meet their users' service and support needs.

- Exhibit III-L-13 suggests that there is considerable growth potential for premium service offerings. Over three-quarters of the System 38 users reported a requirement for standby coverage (76%), maintenance management--a form of single source service--(84%), and under two-hour response (88%). The last is puzzling, since the average IBM System 38 response time was already under two hours (1.8 hours). This curious result reflects the growing importance that users place on quick response time as a way of increasing system availability, a trend that is prompting many vendors to increase such activities as remote support and redundant systems.

EXHIBIT III-L-12

CURRENT TPM USE
IBM



A surprisingly small percentage of IBM system 38 users are experienced with TPM, most likely a reflection of high satisfaction with their current service.

EXHIBIT III-L-13

USER REQUIREMENTS FOR EXTENDED SERVICES
IBM

SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT* Low 1 2 3 4 5 6 7 8 9 10 High
Standby Coverage	76%	8.8
Remote Diagnostics	40	7.9
Preventive Maintenance during Non-Prime Hours	56	8.1
Deferred Response	36	7.0
Under Two-Hour Response	88	9.1
Maintenance Management	84	8.5

*Average Standard Error: 0.5

III M. DATA GENERAL

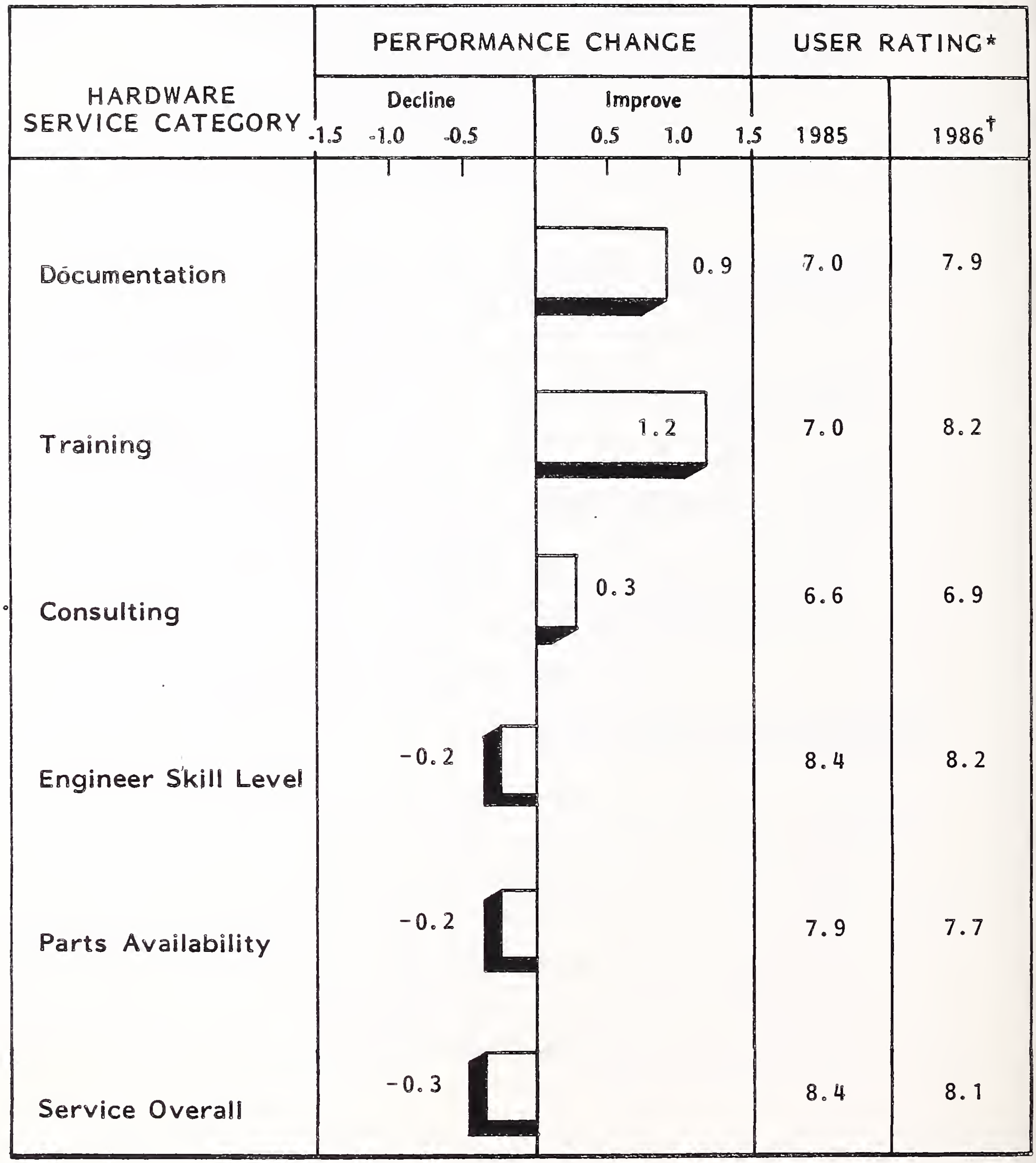
- In April and May 1986 INPUT interviewed 25 Data General MV/10000 superminicomputer users regarding their satisfaction with the service and support they received from their vendor. All interviews were performed by telephone and each interview lasted approximately 20 minutes. INPUT targeted data processing and computer operations managers as respondents. Predominant industries represented in the DG sample included education (with 28% of the sample), process manufacturing, services, medical (each with 16% of the sample), and discrete manufacturing (with 12% of the sample).

- Exhibit III-M-1 indicates that DG superminicomputer service has improved significantly in some areas like documentation and training, yet stayed about the same (considering standard errors of the mean) or slightly deteriorated in other, more important areas, like spare parts, FE skill level and overall service satisfaction. Exhibit III-M-2 shows that service in these last three areas falls below user requirements, and Exhibit III-M-3 reports that user satisfaction is also lowest in these components. The most critical problem appears to be spare parts availability, which satisfies only 39% of the DG superminicomputer sample, up slightly from last year's results. This continuation of user dissatisfaction with spares availability is surprising, considering the work that DG has done (and succeeded in, as reflected by the extremely high marks given to DG in the area of remote support) in remote diagnostics.

- Exhibit III-M-4 graphically demonstrates the inconsistency of DG superminicomputer hardware service. Note that user-reported actuals for training, consulting, and documentation far exceed the user requirement levels. At the same time, more critical areas, such as FE skill level, spare parts availability, and overall satisfaction fall below the users' requirement levels. These results suggest that DG needs to reemphasize efforts to improve user satisfaction with the more "logistics-oriented" areas, such as spares inventory management and distribution.

EXHIBIT III-M-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
DATA GENERAL



HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE (Decline / Improve)	USER RATING* 1985	USER RATING* 1986†
Documentation	0.9	7.0	7.9
Training	1.2	7.0	8.2
Consulting	0.3	6.6	6.9
Engineer Skill Level	-0.2	8.4	8.2
Parts Availability	-0.2	7.9	7.7
Service Overall	-0.3	8.4	8.1

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-M-2

1986 USER HARDWARE SERVICE RATINGS
DATA GENERAL

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	5.6	7.5	1.9
Training	5.5	8.2	2.7
Consulting	6.5	6.9	0.4
Remote Support	7.0	7.9	0.9
Engineer Skill Level	9.1	8.2	(0.9)
Parts Availability	9.1	7.7	(1.4)
Hardware Service Overall	8.9	8.1	(0.8)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-M-3

USER SATISFACTION: HARDWARE SERVICE
DATA GENERAL

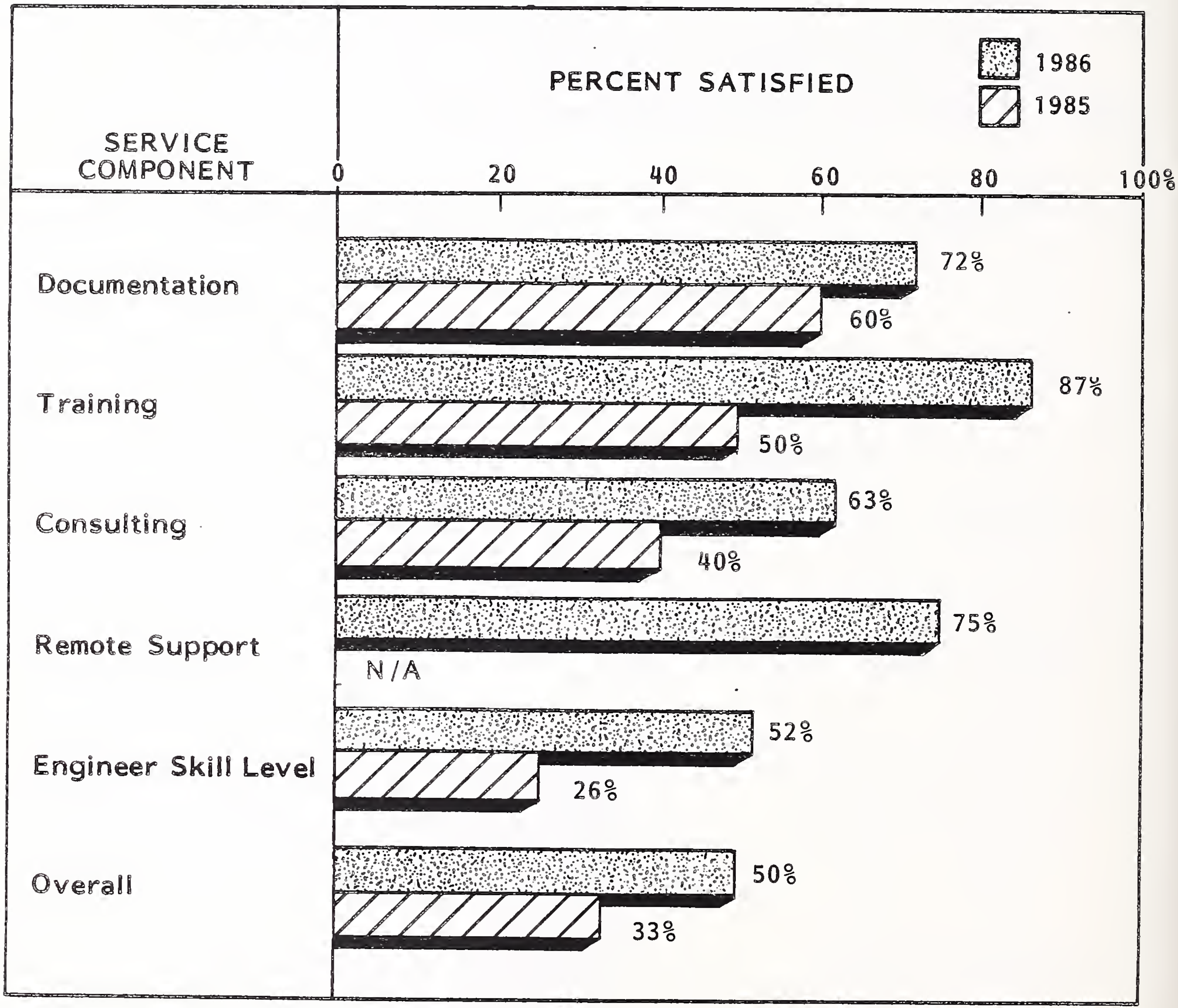
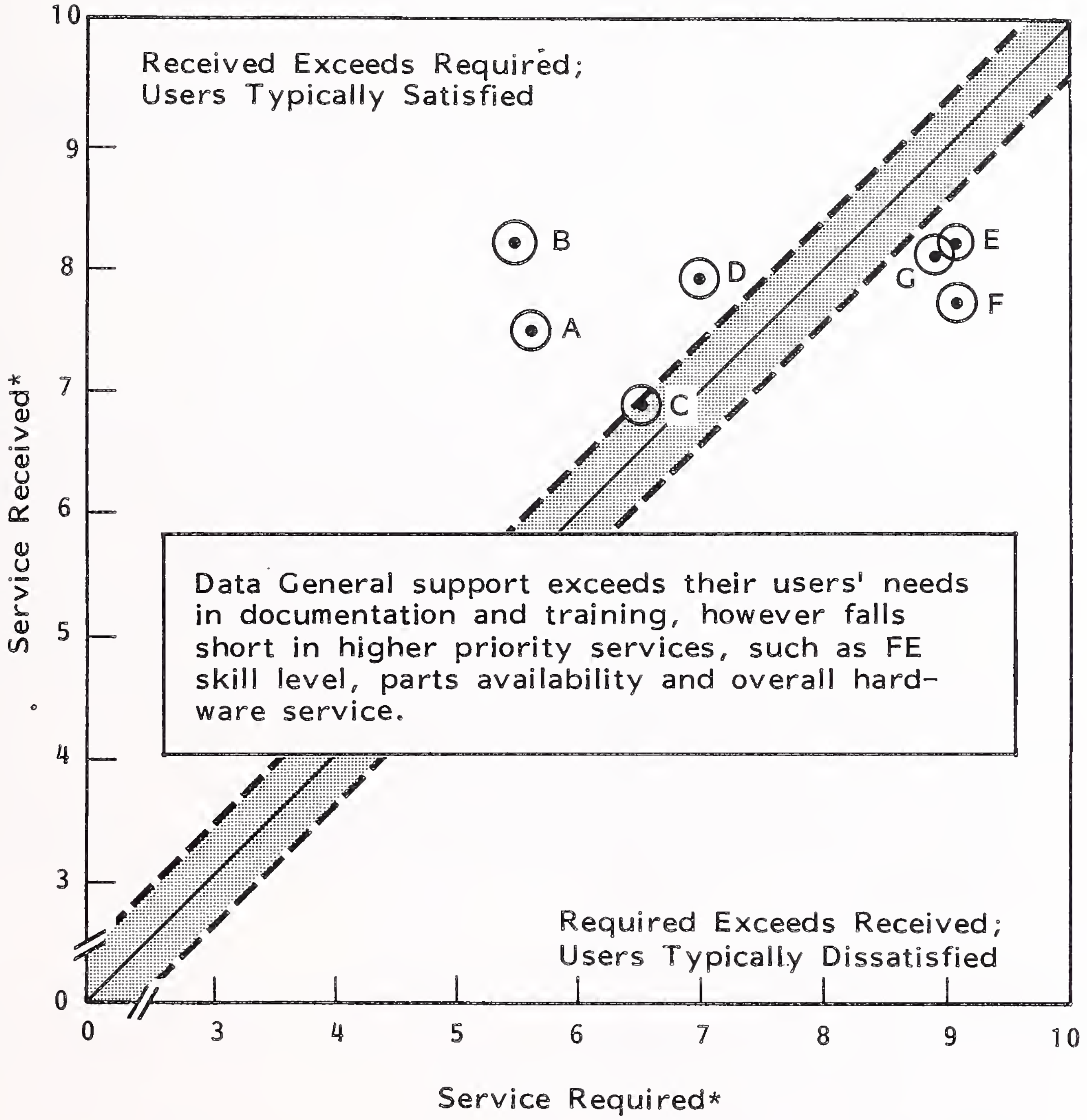


EXHIBIT III-M-4

HARDWARE SERVICES REQUIRED/RECEIVED
DATA GENERAL



Data General support exceeds their users' needs in documentation and training, however falls short in higher priority services, such as FE skill level, parts availability and overall hardware service.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

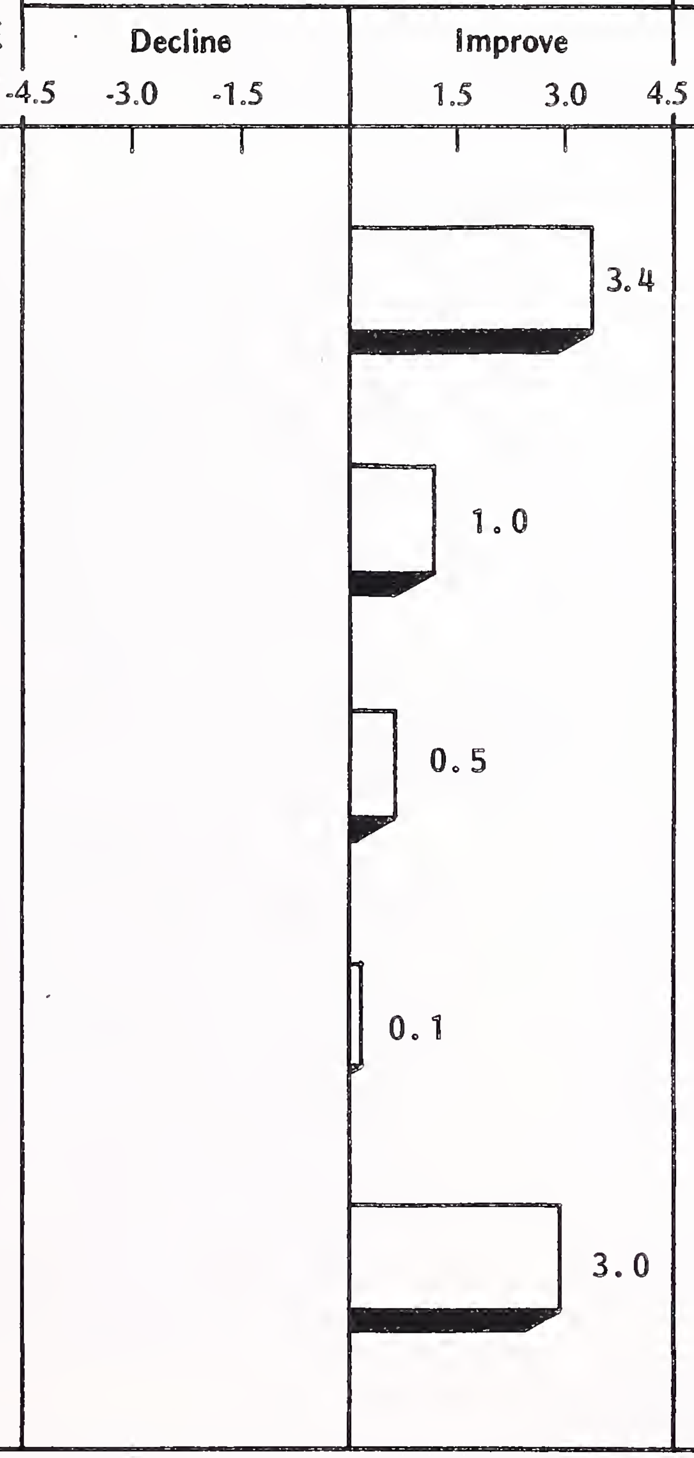
- System software support was a critical area of concern to last year's MV/10000 users. Exhibit III-M-5 indicates that DG has made improvements in most of these areas in 1986. Unfortunately, there is still a lot of room for improvement, as shown in Exhibit III-M-6. DG superminicomputer users have extremely high software support requirements, much higher than scientific/engineering superminicomputer users. Most immediate attention is needed in the area of software engineer skill level, which received an average rating well below the user requirement level. Exhibit III-M-7 further suggests that DG superminicomputer users are not satisfied with the support that they are receiving, particularly in the highest priority services, graphically shown in Exhibit III-M-8.

- Exhibit III-M-9 shows that Data General superminicomputer service performance, by more traditional measures, is very similar to last year's performance. System availability is nearly identical, hardware problem resolution time (response and repair time) is fairly close, and software problem resolution time is actually improved over last year's marks. Yet user satisfaction with the timeliness of software support is down, as shown in Exhibit III-M-10, as a result of the increasing user support requirements of DG MV/10000 users. Not surprisingly, DG superminicomputer users are extremely willing to increase their involvement in software support, as indicated in Exhibit III-M-11. This does not bode well for DG, as it will become increasingly difficult to sell additional software support to these users once they become self-reliant.

- INPUT has indicated that the superminicomputer market would become the next battlefront for third-party maintenance, and Exhibit III-M-12 supports that prediction--44% of DG MV/10000 users report experience with TPM, up slightly over last year's sample (40%). While this partly reflects the presence of "foreign" peripherals at DG sites, this also points to the potential of increased TPM penetration into DG sites if user service requirements are not met.

EXHIBIT III-M-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
DATA GENERAL



SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING*	
		1985	1986†
Documentation	3.4	4.0	7.4
Training	1.0	6.3	7.3
Consulting	0.5	6.7	7.2
Engineer Skill Level	0.1	6.5	6.6
Service Overall	3.0	4.0	7.0

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-M-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
DATA GENERAL

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	▨ 8.8	▨ 7.4	▨ (1.4)
Training	▨ 7.6	▨ 7.3	▨ (0.3)
Consulting	▨ 8.1	▨ 7.2	▨ (0.9)
Remote Support	▨ 8.4	▨ 7.4	▨ (1.0)
Engineer Skill Level	▨ 9.0	▨ 6.6	▨ (2.4)
Service Overall	▨ 8.5	▨ 7.0	▨ (1.5)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-M-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
DATA GENERAL

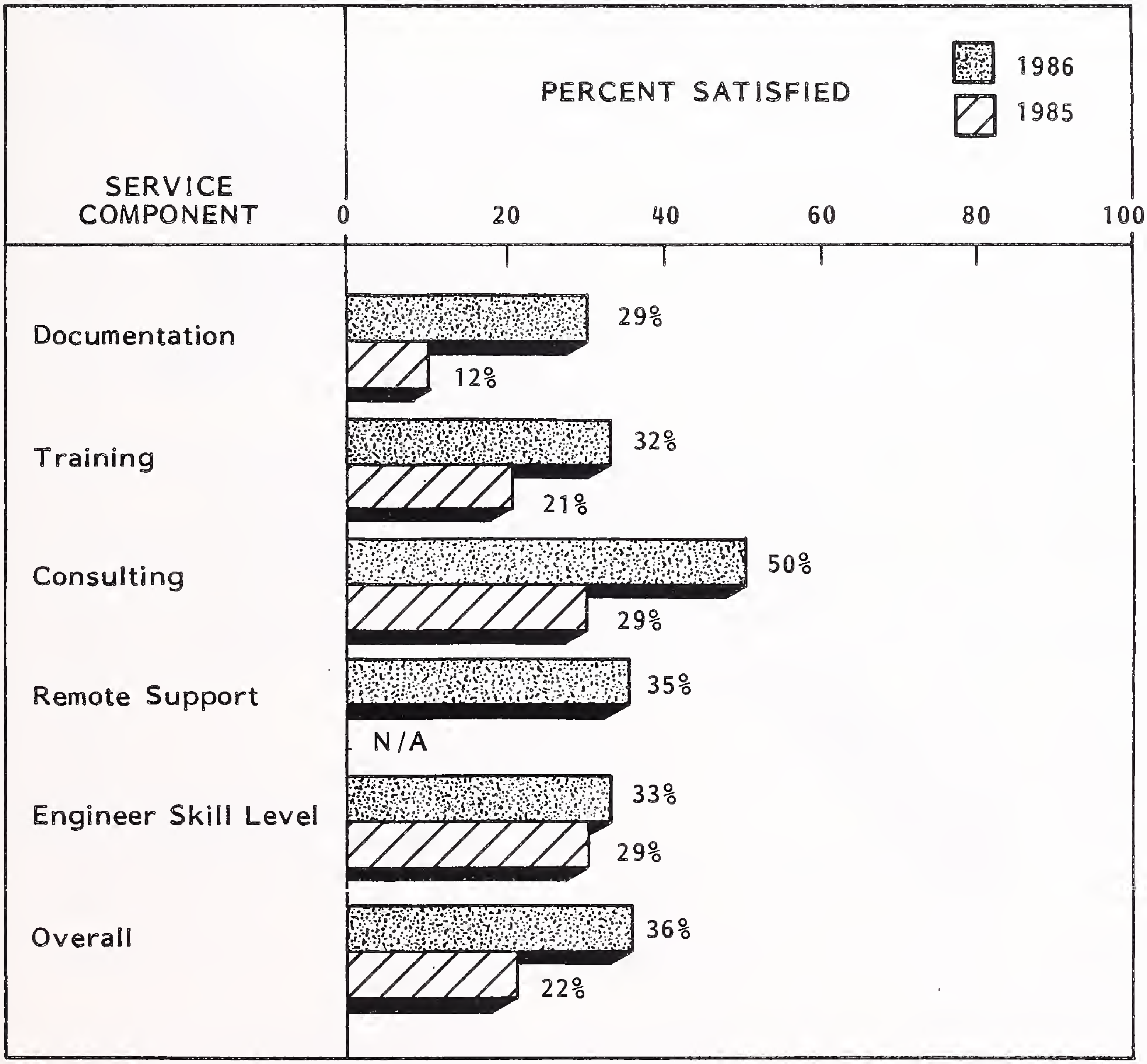
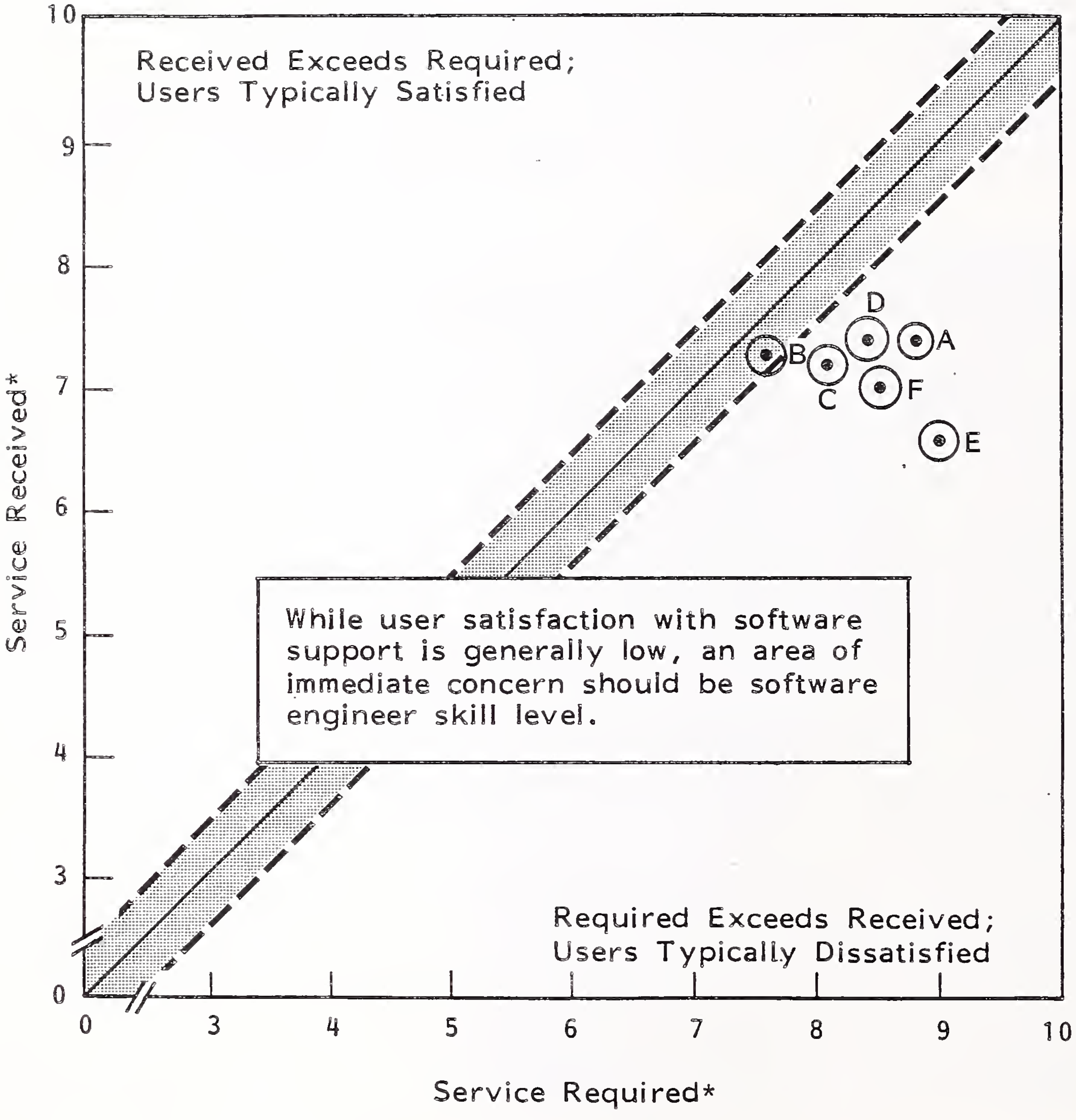


EXHIBIT III-M-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
DATA GENERAL



While user satisfaction with software support is generally low, an area of immediate concern should be software engineer skill level.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-M-9

SERVICE PERFORMANCE
DATA GENERAL

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	97.3%	97.1%
Average Number of Interruptions		
Per Month (Number)	1.9	1.4
Percent Hardware Caused	37.0%	49.0%
Percent Software Caused	46.0%	37.0%
Average Hardware Response Time (Hours)	4.2 hr.	3.0 hr.
Average Hardware Repair Time (Hours)	2.6 hr.	4.1 hr.
Average Systems Software Response Time (Hours)	2.2 hr.	3.6 hr.
Average Systems Software Repair Time (Hours)	26.0 hr.	13.4 hr.

EXHIBIT III-M-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE
DATA GENERAL

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent) Falls Short of Expectations	VENDOR PERFORMANCE (Percent) Exceeds Expectations
System Availability (Percent)	97.4	0	0
Hardware Response Time (Hours)	3.1		3%
Hardware Repair Time (Hours)	3.7	11%	
Systems Software Response Time (Hours)	2.3	56%	
Systems Software Repair Time (Hours)	6.1	119%	

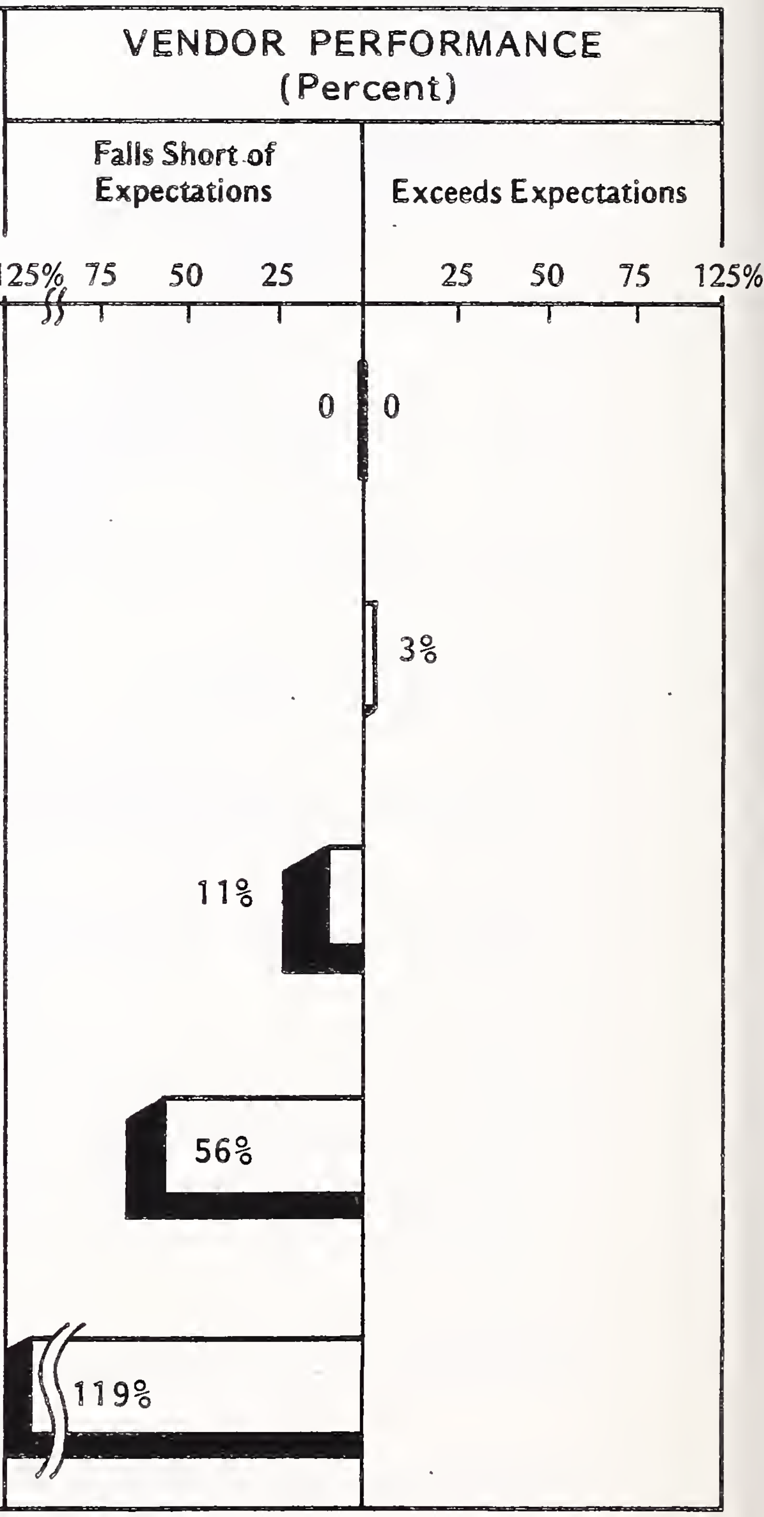
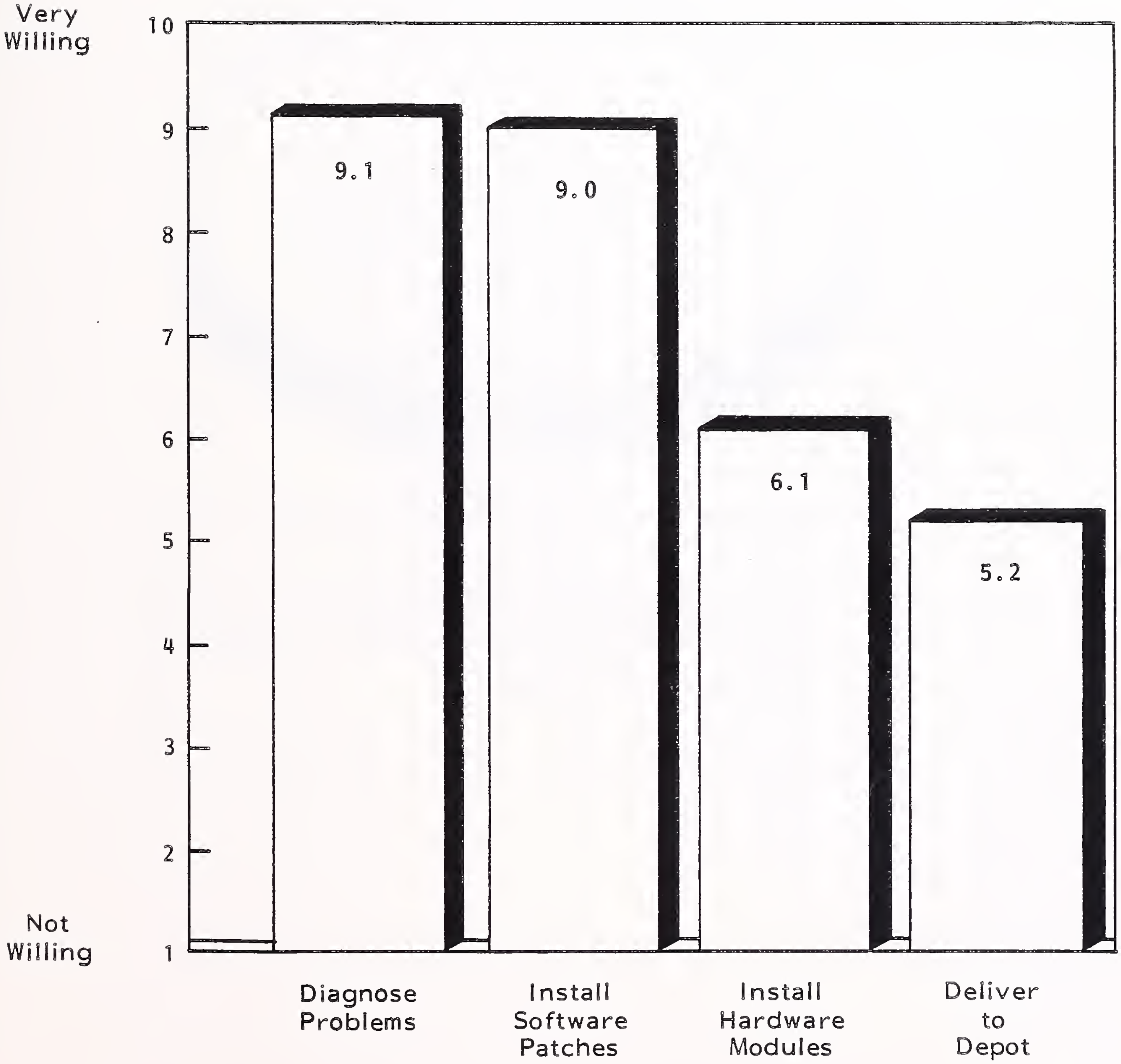


EXHIBIT III-11

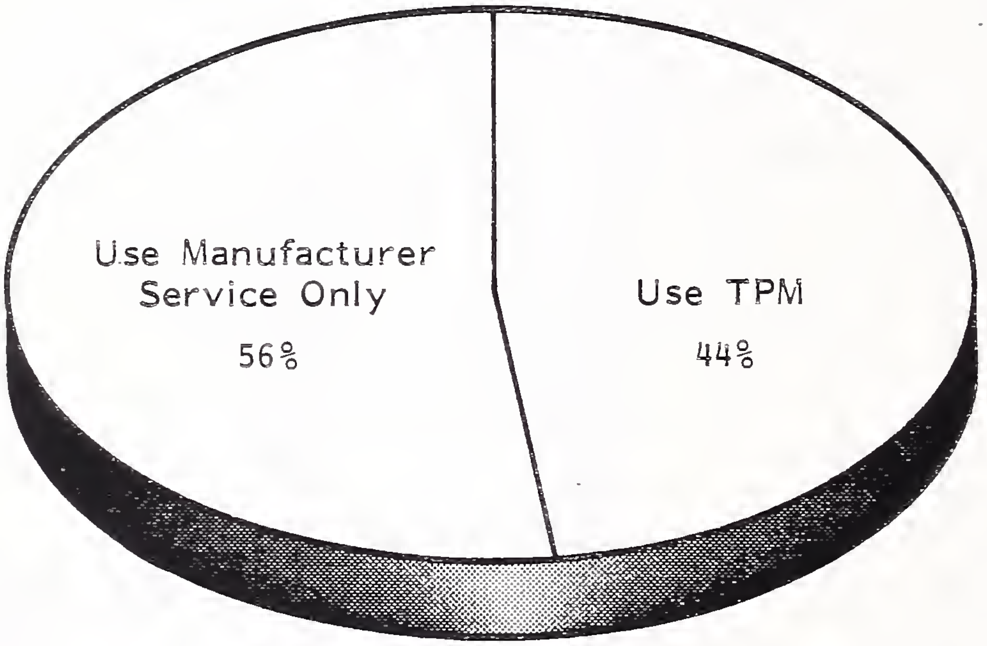
USER WILLINGNESS TO PERFORM MAINTENANCE
DATA GENERAL



* Average Standard Error: 0.3

EXHIBIT III-M-12

CURRENT TPM USE
DATA GENERAL



Forty-four percent of Data General MV/10000 users are experienced with TPM, up slightly from last year's sample.

- Exhibit III-M-13 presents DG superminicomputer user requirements for premium services. While user attraction to the majority of these services was higher than the industry norm, one service, PM's performed during non-prime hours, warrants particular attention, as the increased user interest hints at the growing multi-shift use of superminicomputers.

EXHIBIT III-M-13

USER REQUIREMENTS FOR EXTENDED SERVICES
DATA GENERAL

SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT* Low 1 2 3 4 5 6 7 8 9 10 High
Standby Coverage	60%	8.3
Remote Diagnostics	68	8.0
Preventive Maintenance during Non-Prime Hours	68	8.6
Deferred Response	32	7.9
Under Two-Hour Response	40	7.7
Maintenance Management	48	7.9

*Average Standard Error: 0.5

III N. DIGITAL EQUIPMENT CORPORATION

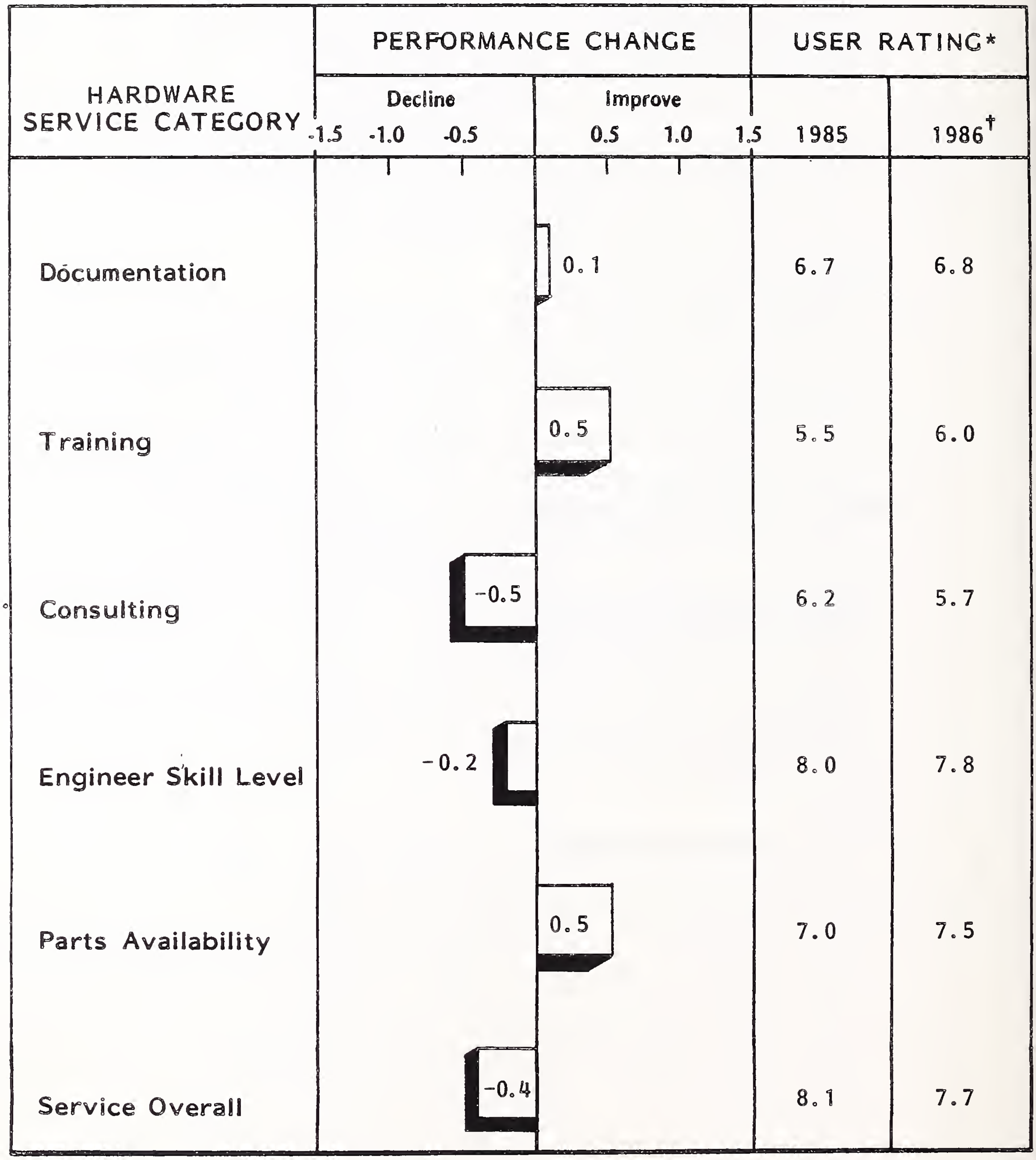
- In April 1986 INPUT interviewed 25 DEC VAX 11/7XX superminicomputer users concerning the quality of hardware maintenance and software support that they received from their vendor. All interviews were conducted by telephone and each lasted approximately 20 minutes. Respondents typically were directors or managers of data processing. The sample was weighted by two industries, services (which accounted for 36% of the sample) and discrete manufacturers (which made up an additional 32% of the sample). The rest of the sample were companies from the following industries: process manufacturing, education, and federal government.

- Exhibit III-N-1 demonstrates that DEC superminicomputer hardware service performance stayed relatively constant (considering the standard error of the mean) from 1985 to 1986. Exhibit III-N-2 presents a less favorable view of DEC hardware service performance, however, since the level of service received falls well below user requirements in the most critical service areas of FE skill level, spare parts availability, and overall satisfaction with hardware service. Not surprisingly, user satisfaction with these three areas is lowest, as shown in Exhibit III-N-3. In fact, DEC satisfies less than one-half of their superminicomputer users in the areas of parts availability and hardware service overall. Exhibit III-N-4 graphically demonstrates the gap between user requirements and actual service received in these high requirement areas.

- Systems software support is a slightly bigger problem for DEC. While DEC made significant improvements in the quality of system software documentation (as shown in Exhibit III-N-5), users perceived a decline in the ability of DEC software engineers in 1986. Exhibit III-N-6 indicates that while DEC users do not have exceptionally high service requirements in any one area, DEC comes close to meeting user requirements in only one service area (systems software training). While DEC users have been relatively accepting

EXHIBIT III-N-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
DEC



HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING* 1985	USER RATING* 1986†
Documentation	0.1	6.7	6.8
Training	0.5	5.5	6.0
Consulting	-0.5	6.2	5.7
Engineer Skill Level	-0.2	8.0	7.8
Parts Availability	0.5	7.0	7.5
Service Overall	-0.4	8.1	7.7

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-N-2

1986 USER HARDWARE SERVICE RATINGS
DEC

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	6.7	6.8	0.1
Training	6.2	6.0	(0.2)
Consulting	6.3	5.7	(0.6)
Remote Support	7.7	7.6	(0.1)
Engineer Skill Level	8.8	7.8	(1.0)
Parts Availability	9.0	7.5	(1.5)
Hardware Service Overall	8.7	7.7	(1.0)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-N-3

USER SATISFACTION: HARDWARE SERVICE
DEC

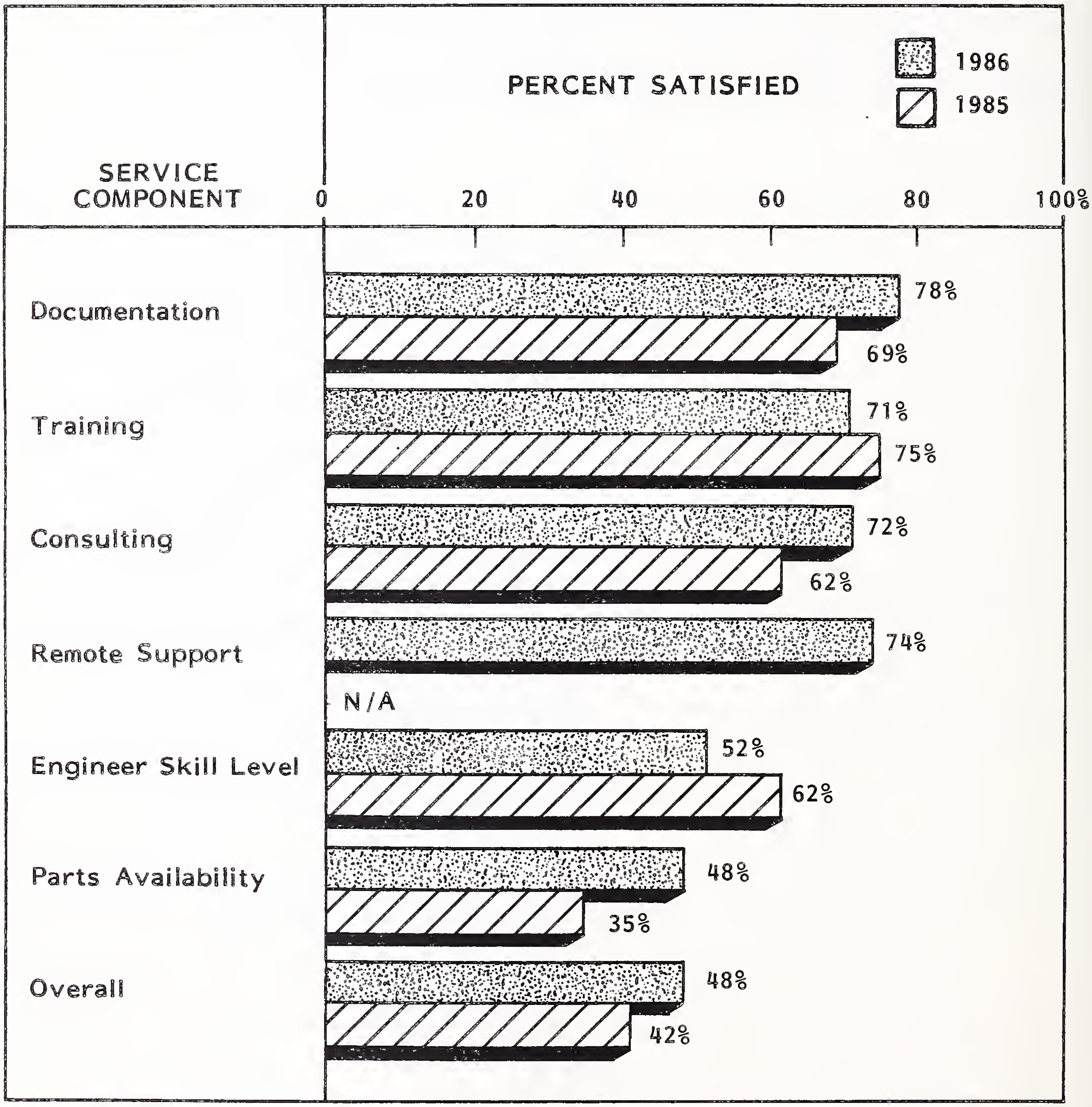
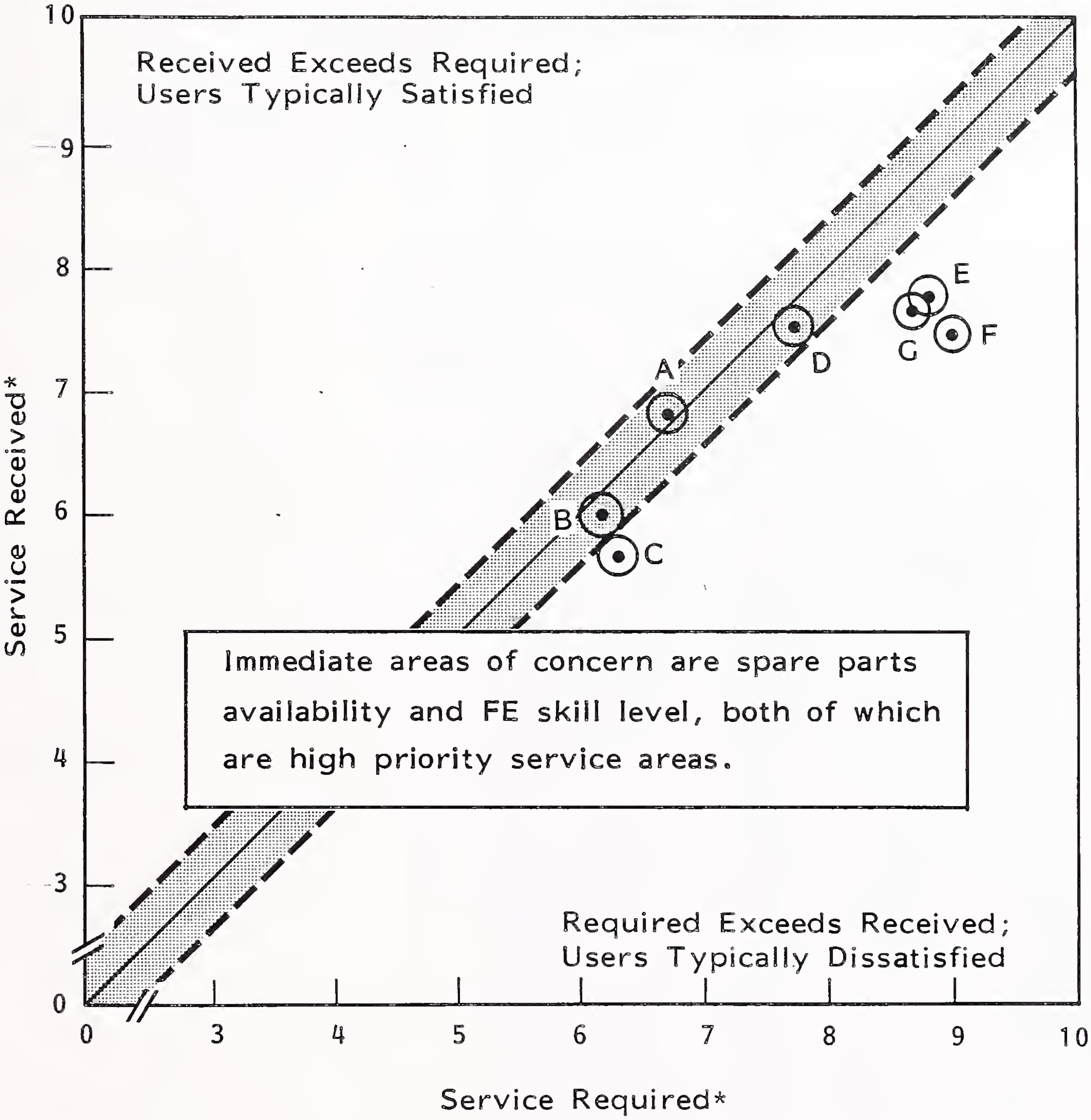


EXHIBIT III-N-4

HARDWARE SERVICES REQUIRED/RECEIVED
DEC



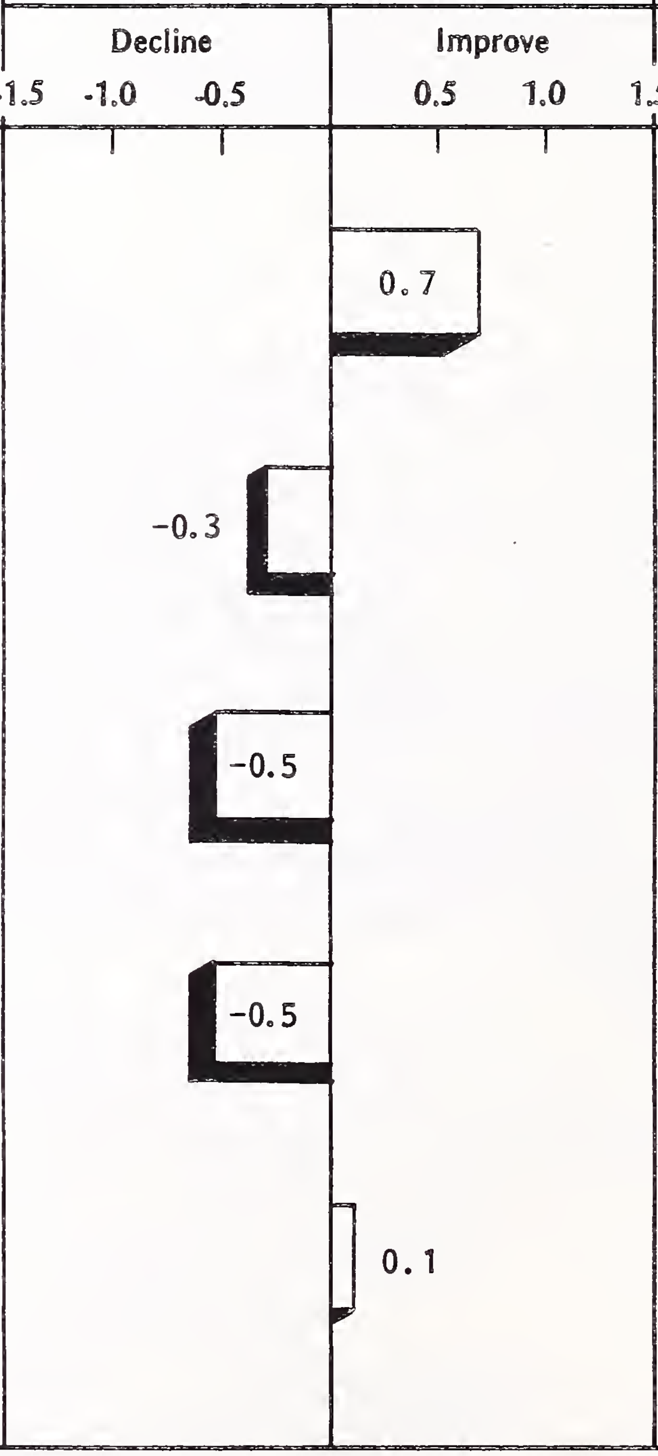
Immediate areas of concern are spare parts availability and FE skill level, both of which are high priority service areas.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-N-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
DEC



SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING*	
		1985	1986†
Documentation	0.7	7.0	7.7
Training	-0.3	6.7	6.4
Consulting	-0.5	6.6	6.1
Engineer Skill Level	-0.5	7.5	7.0
Service Overall	0.1	6.8	6.9

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-N-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
DEC

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	8.6	7.7	(0.9)
Training	6.5	6.4	(0.1)
Consulting	6.9	6.1	(0.8)
Remote Support	7.3	6.3	(1.0)
Engineer Skill Level	8.3	7.0	(1.3)
Service Overall	7.9	6.9	(1.0)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

of this, as indicated by satisfaction percentages shown in Exhibit III-N-7, note the significant drop in the percentage of DEC superminicomputer users who are satisfied with the skill level of their software engineer. Exhibit III-N-8 graphically shows the gap between user requirements and vendor actuals, particularly in the area of software engineer skill level.

- Exhibit III-N-9 indicates that DEC has improved system availability, both by improving product reliability (as indicated by a significant drop in the number of system interruptions) and by speeding up both hardware and software total problem resolution times. However, user software support requirements are growing very rapidly in the superminicomputer market, and Exhibit III-N-10 demonstrates that while software problem resolution improved, user requirements for problem resolution increased at a faster rate.

- Digital has been very effective in the marketing of their extensive support offerings. In most cases, their service menu has emphasized vendor-supplied services that tend to lock a customer into increased interaction with the vendor. Therefore, it is not surprising that DEC superminicomputer users are not extremely attracted to increasing their involvement in the servicing of their own equipment, as demonstrated in Exhibit III-N-11. In fact, Exhibit III-N-12 indicates that DEC users are increasingly attracted to additional premium service offerings, like non-prime PM visits, remote diagnostics, and maintenance management contracts.

- Digital's installed base has been a traditional target market for third-party maintenance companies, in part due to DEC's willingness, in fact encouragement, of users to go to OEM and VARS who provided the lowest complete system cost, regardless of peripheral manufacturer. As a result, a high percentage of DEC sites contained "foreign" peripherals, which encouraged TPM penetration into these locations. Exhibit III-N-13 demonstrates that 40% of all DEC users are experienced with TPM. DEC has actively participated in the TPM market by offering limited services to users of DEC systems with non-DEC peripherals.

EXHIBIT III-N-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
DEC

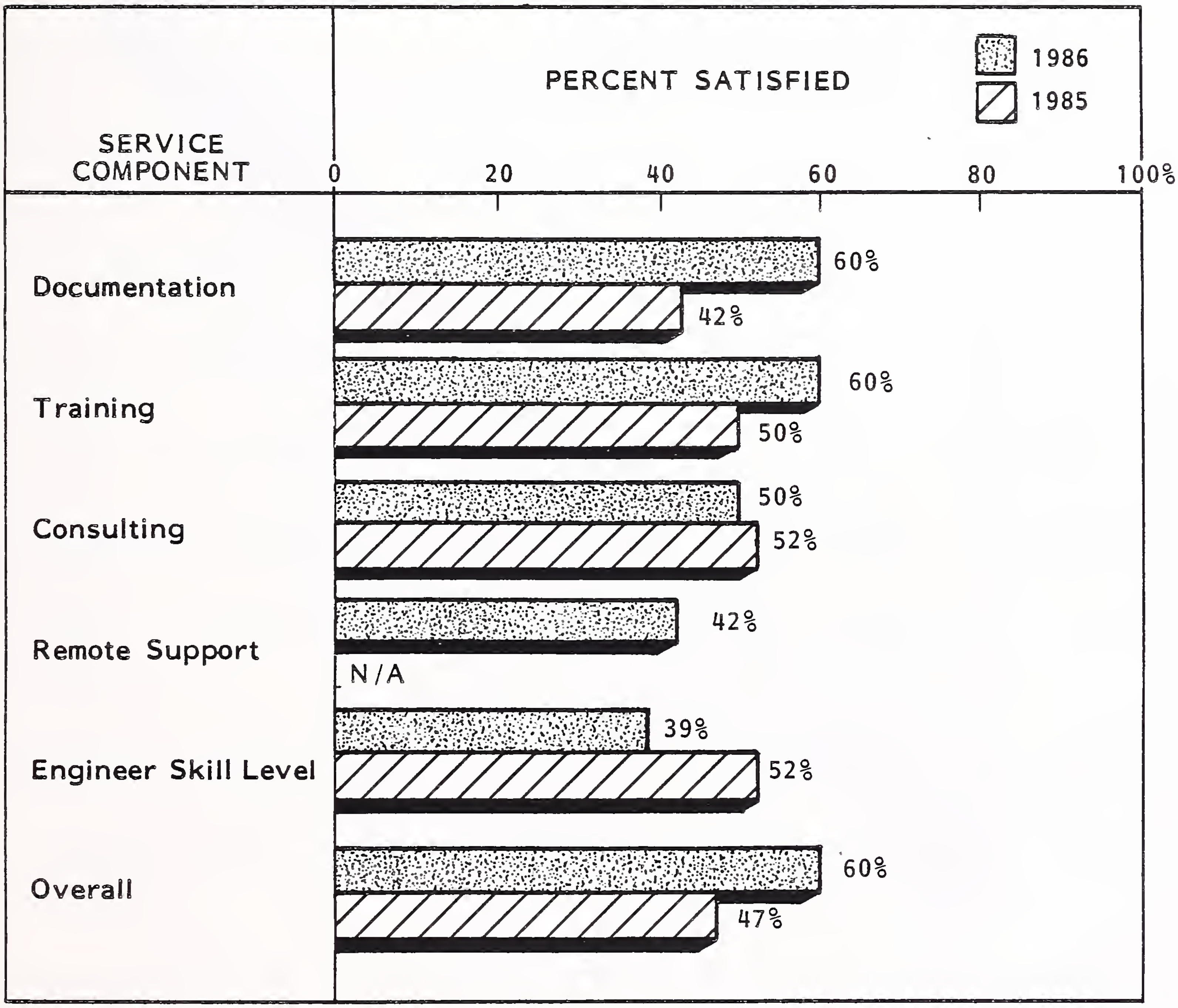
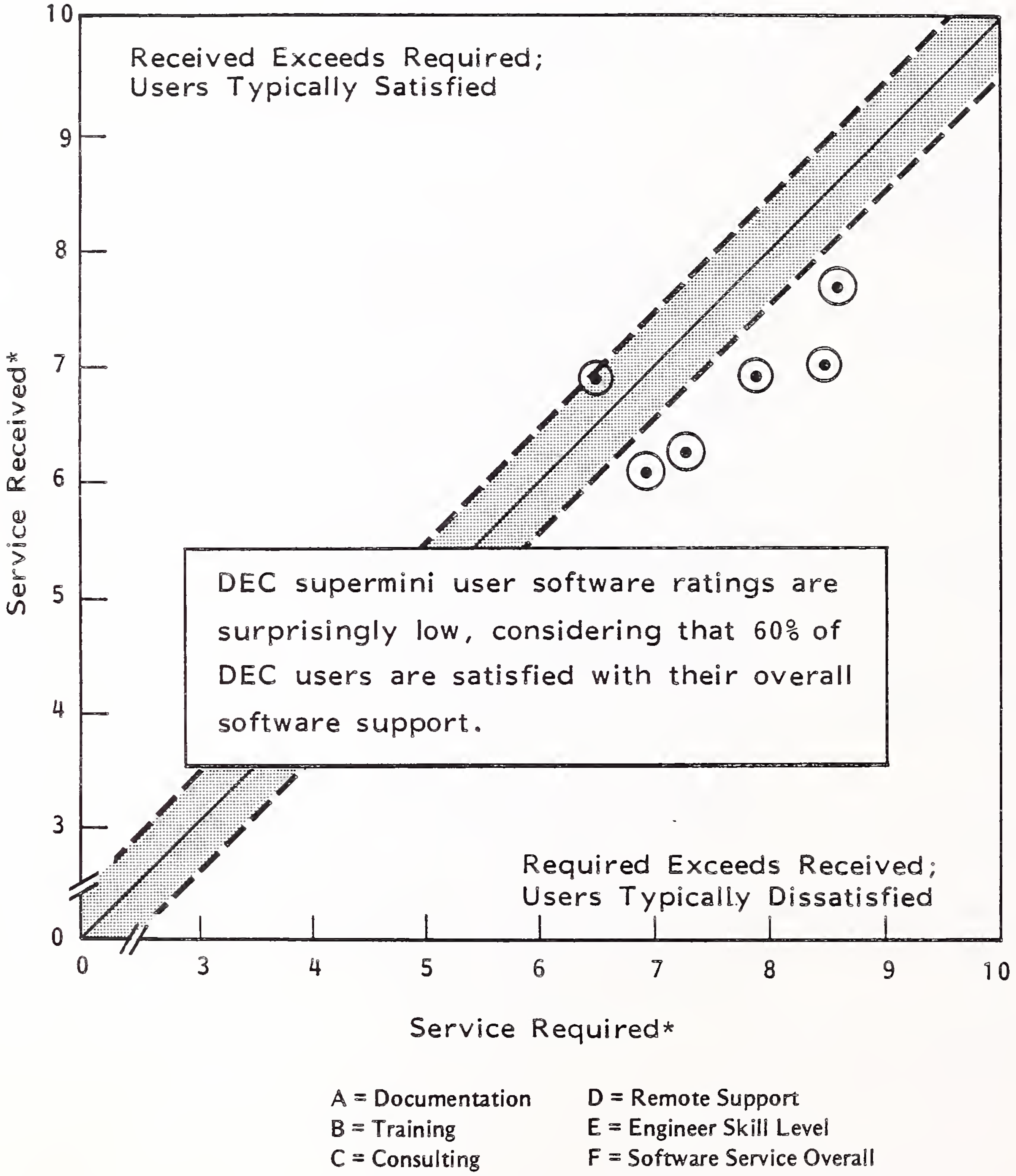


EXHIBIT III-N-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
DEC



DEC supermini user software ratings are surprisingly low, considering that 60% of DEC users are satisfied with their overall software support.

* Rating: 1 = Low, 10 = High

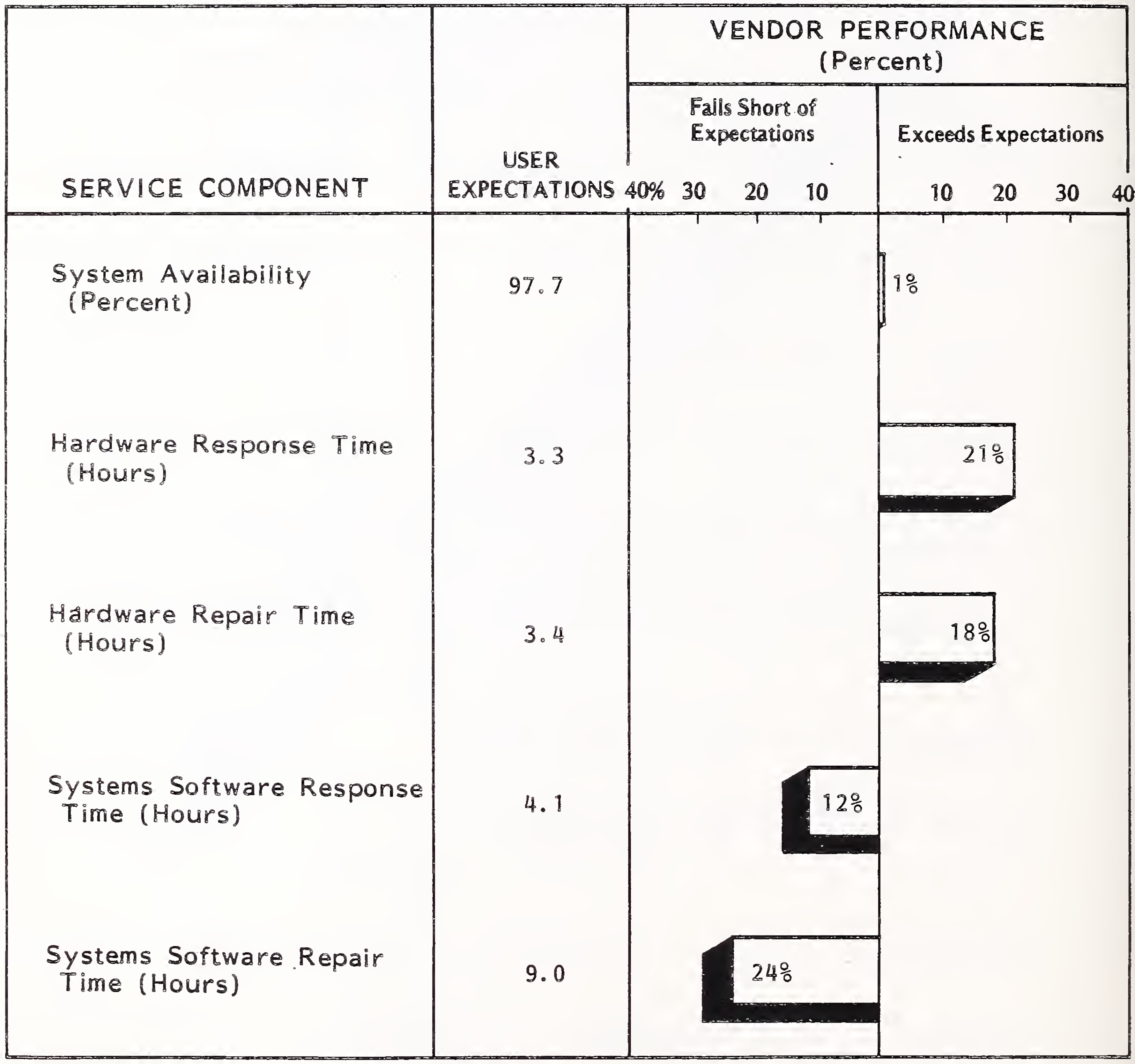
EXHIBIT III-N-9

SERVICE PERFORMANCE
DEC

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	96.6%	98.5%
Average Number of Interruptions		
Per Month (Number)	2.5	1.5
Percent Hardware Caused	70.0%	70.0%
Percent Software Caused	30.0%	25.0%
Average Hardware Response Time (Hours)	2.4 hr.	2.6 hr.
Average Hardware Repair Time (Hours)	3.9 hr.	2.8 hr.
Average Systems Software Response Time (Hours)	9.5 hr.	4.6 hr.
Average Systems Software Repair Time (Hours)	10.9 hr.	11.2 hr.

EXHIBIT III-N-10

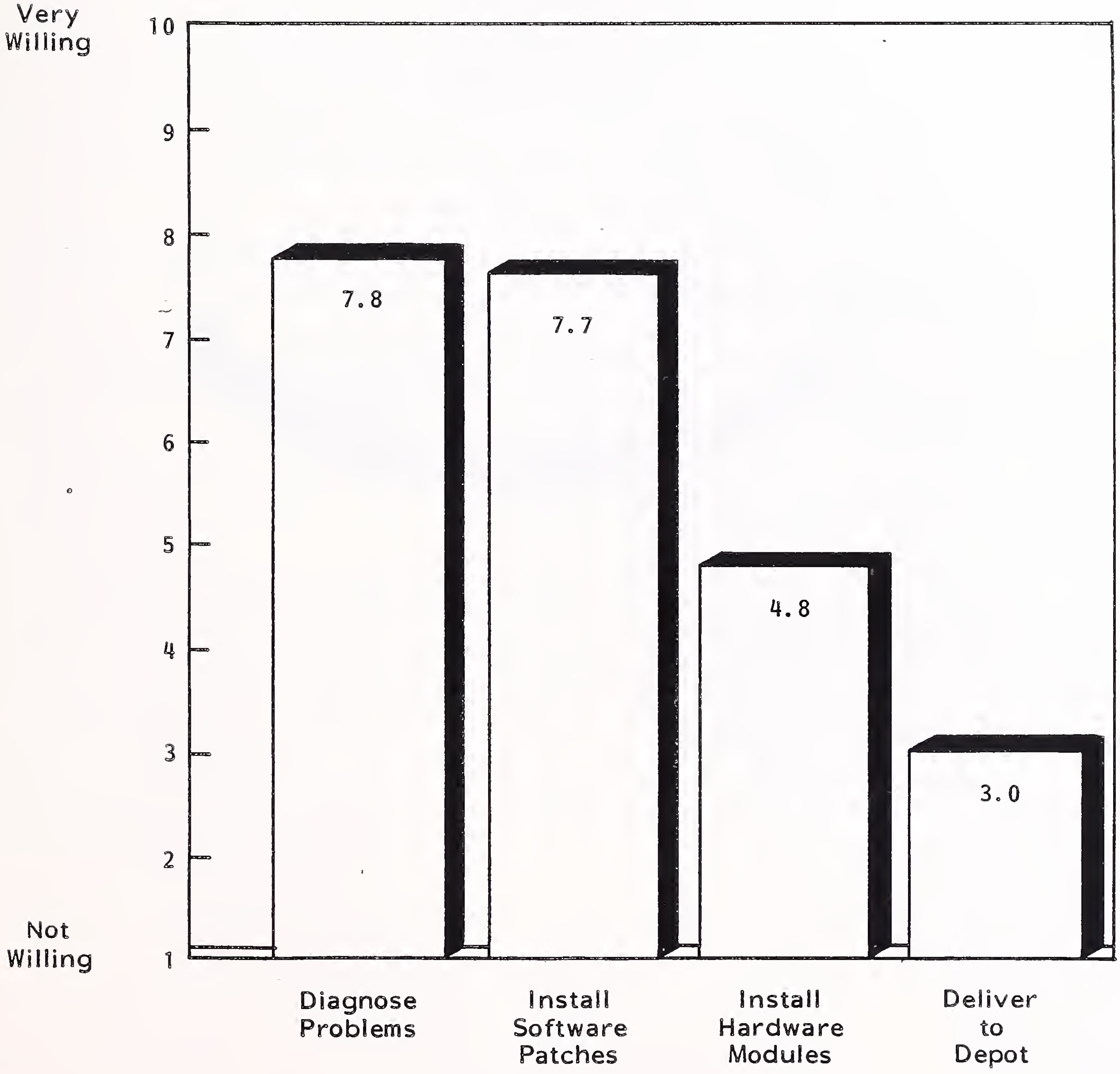
USER EXPECTATIONS FOR SERVICE PERFORMANCE
DEC



SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent) Falls Short of Expectations	VENDOR PERFORMANCE (Percent) Exceeds Expectations
System Availability (Percent)	97.7		1%
Hardware Response Time (Hours)	3.3		21%
Hardware Repair Time (Hours)	3.4		18%
Systems Software Response Time (Hours)	4.1	12%	
Systems Software Repair Time (Hours)	9.0	24%	

EXHIBIT III-N-11

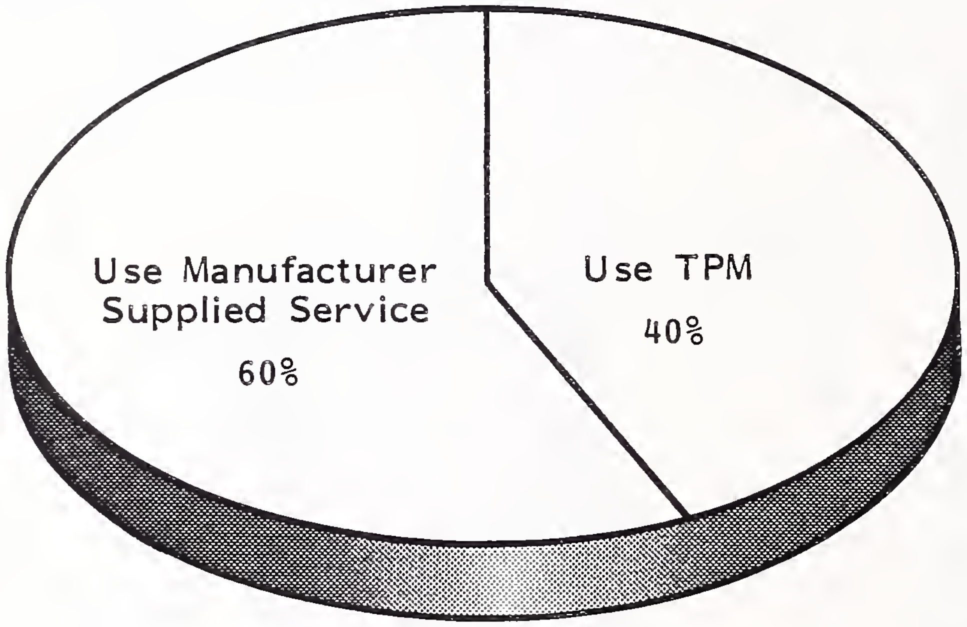
USER WILLINGNESS TO PERFORM MAINTENANCE
DEC



* Average Standard Error: 0.3

EXHIBIT III-N-12

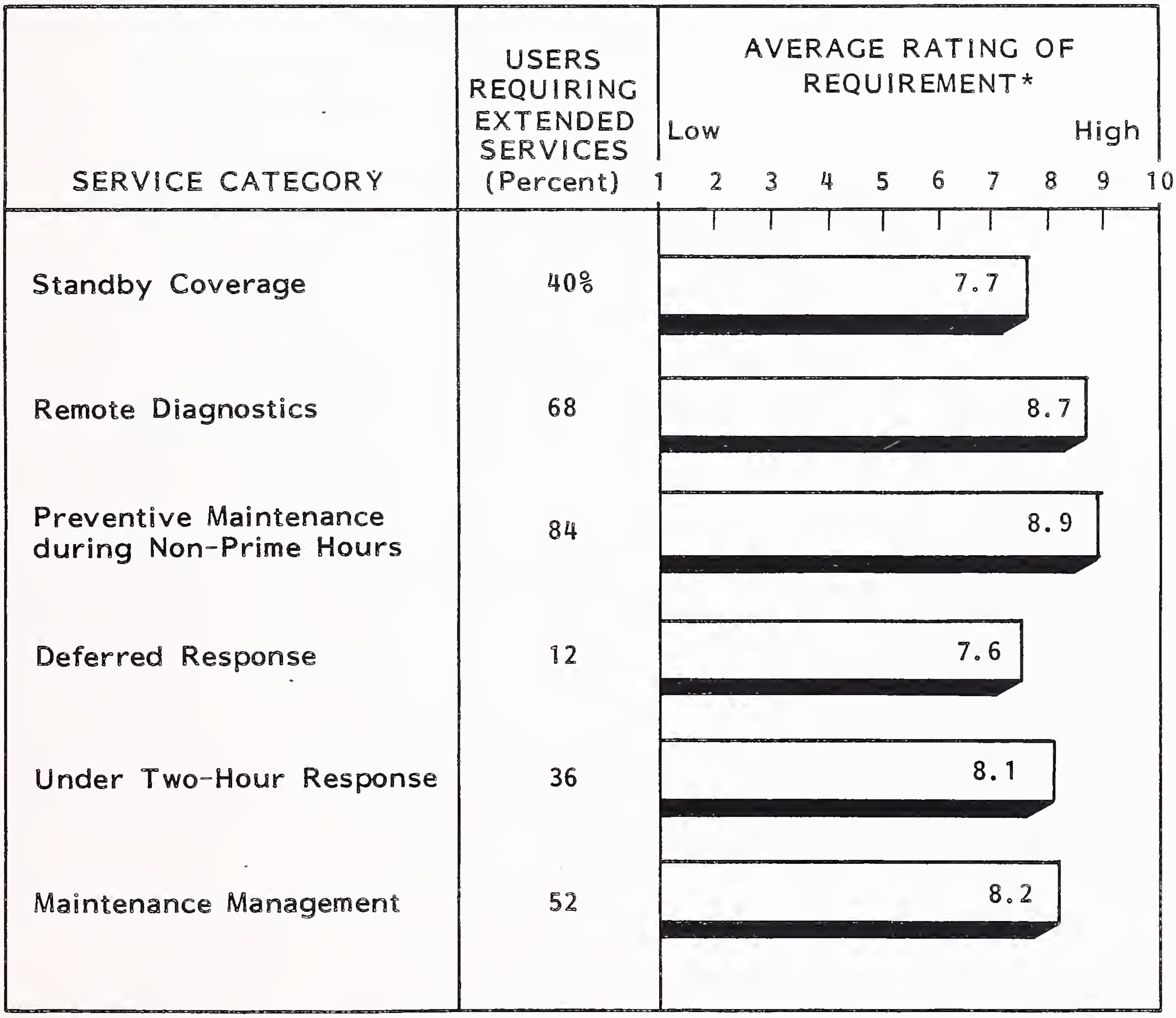
CURRENT TPM USE
DEC



DEC systems have traditionally been a large market for third-party maintenance.

EXHIBIT III-N-13

USER REQUIREMENTS FOR EXTENDED SERVICES
DEC



SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT*
Standby Coverage	40%	7.7
Remote Diagnostics	68	8.7
Preventive Maintenance during Non-Prime Hours	84	8.9
Deferred Response	12	7.6
Under Two-Hour Response	36	8.1
Maintenance Management	52	8.2

*Average Standard Error: 0.7

III O. AT&T

- In May 1986 INPUT interviewed 20 AT&T 3B/XXX superminicomputer users regarding their satisfaction with the hardware service and system software support that they have received from their manufacturer. All interviews were performed by telephone, each approximately 20 minutes in length. INPUT targeted the highest ranking data processing individual available, usually a director or manager of data processing; however, the smaller size of some of the AT&T user organizations required us to interview owners or vice presidents of these companies. Also, two respondents were involved more directly with the financial operations of their companies (as treasurers), perhaps reflecting the application of the AT&T 3Bs at their sites. The industry breakdown of the AT&T sample reflects an emphasis on business services, which made up 35% of the survey sample. Other industries represented by a number of respondents include discrete manufacturing, education, and retail distribution.

- Exhibit III-O-1 indicates that AT&T 3B users have recognized a significant improvement in virtually all hardware maintenance components tested in 1985 and 1986. Of course, 1985 was AT&T's first year in the computer maintenance industry, and, as "freshmen" in the business, demonstrated the uneven performance one would usually associate with a "rookie player." It is promising that users reported improvements in key areas such as parts availability, and in secondary service areas, such as consulting and training.

- However, there is still much room for improvement, as indicated by Exhibit III-O-2. After taking the standard error of the mean into account, AT&T succeeds in meeting their users' service requirement levels in only three of the seven hardware service categories analyzed in 1986. More importantly, only one of these areas of service satisfaction, FE skill level, can be considered a high priority service, at least as perceived by users.

EXHIBIT III-O-1

HARDWARE SERVICE PERFORMANCE, 1985-1986

AT&T

HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE: Decline (-3.0 -2.0 -1.0)	PERFORMANCE CHANGE: Improve (1.0 2.0 3.0)	USER RATING*: 1985	USER RATING*: 1986†
Documentation		0.4	5.1	5.5
Training		2.5	3.5	6.0
Consulting		2.3	5.0	7.3
Engineer Skill Level		1.2	6.5	7.7
Parts Availability		1.9	4.8	6.7
Service Overall		1.4	6.1	7.5

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-O-2

1986 USER HARDWARE SERVICE RATINGS
AT&T

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	▨ 8.2	▨ 5.9	▨ (2.3)
Training	▨ 6.3	▨ 6.0	▨ (0.3)
Consulting	6.9	7.3	0.4
Remote Support	▨ 8.2	▨ 6.9	▨ (1.3)
Engineer Skill Level	▨ 8.1	▨ 7.7	▨ (0.4)
Parts Availability	▨ 8.9	▨ 6.7	▨ (2.2)
Hardware Service Overall	▨ 8.5	▨ 7.5	▨ (1.0)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

- Of particular concern should be the low user satisfaction reported in the areas of parts availability, which satisfies only 33% of AT&T 3B users (as shown in Exhibit III-O-3) and of hardware documentation, which satisfies only 12%. The user dissatisfaction with spare parts availability is also reflected in hardware response and repair times (which will be discussed later). The dissatisfaction with hardware documentation can also be more directly costly to AT&T, since a number of user problems that require dispatching are often documentation-related.

- Exhibit III-O-4 graphically demonstrates the gap between AT&T user hardware service requirements versus hardware service received.

- Software support is another area where AT&T has made significant progress, as shown in Exhibit III-O-5. Again, user satisfaction with AT&T's support was extremely low in 1985, so AT&T had a lot of room for improvement. Nevertheless, AT&T demonstrated much progress in all software support categories analyzed, particularly training and consulting.

- Exhibit III-O-6 indicates that, similar to hardware maintenance, AT&T has still a long way to go in meeting the rapidly growing software support requirements that are indicative of superminicomputer users. As was true on the hardware side, software documentation is an extremely critical problem at AT&T, satisfying only 20% of the 1986 AT&T 3B sample, as shown in Exhibit III-O-7. Furthermore, AT&T fails to satisfy 50% of their 3B users in every category analyzed, and only 25% of AT&T's users are satisfied with software support overall. Exhibit III-O-8 further demonstrates the work still ahead for AT&T in the area of software support.

- Exhibit III-O-9 illustrates the improvements that AT&T has made in the reliability of their equipment and the responsiveness of support. System availability improved from 90.9% in 1985 to an admirable 98.7% in 1986. The number of system interruptions improved from 4.4 per month to an acceptable 1.6 per month. Hardware problem resolution turnaround time went from an extremely high 35.7 hours to 13.9 hours in 1986.

EXHIBIT III-O-3

USER SATISFACTION: HARDWARE SERVICE
AT&T

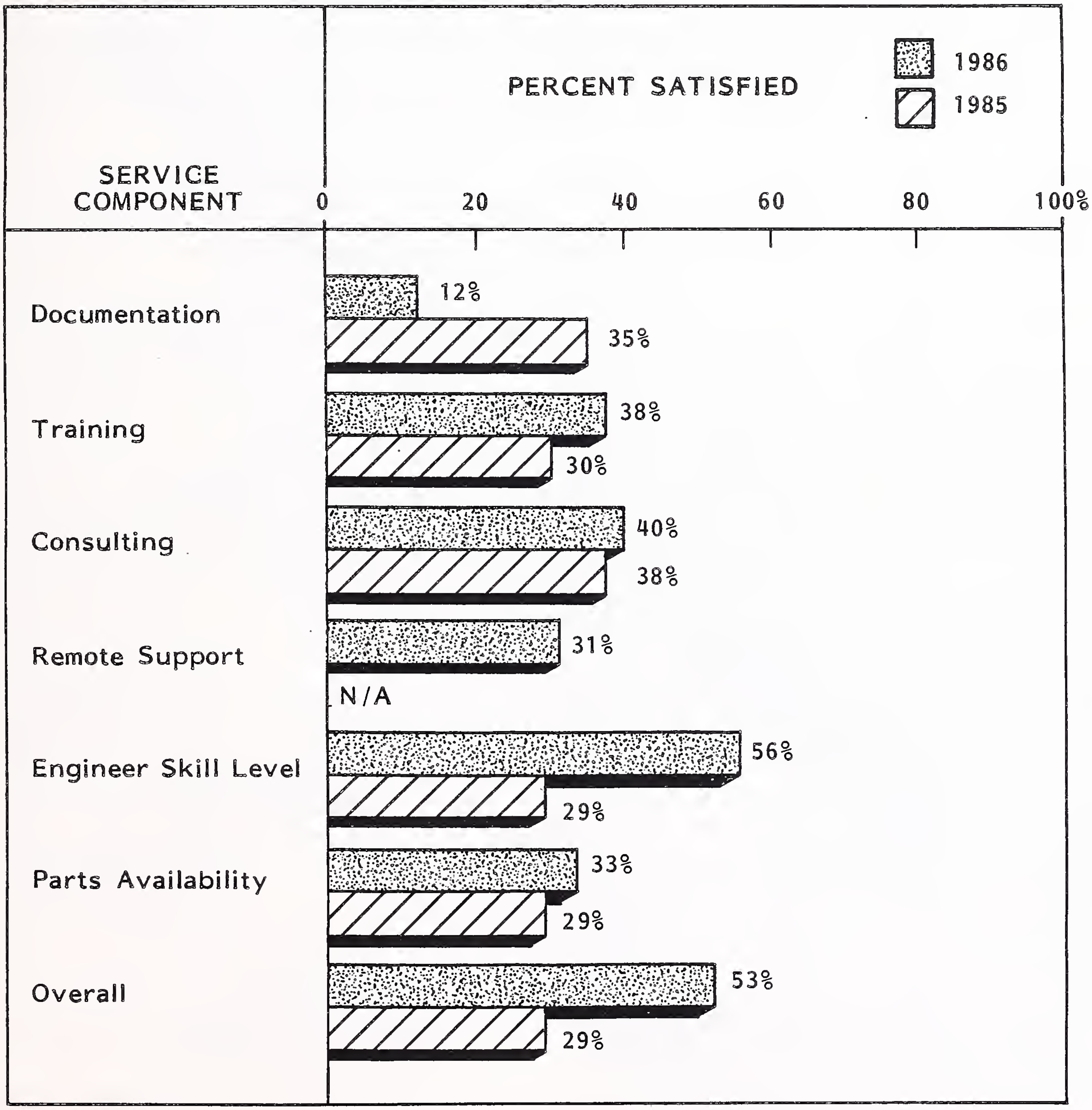
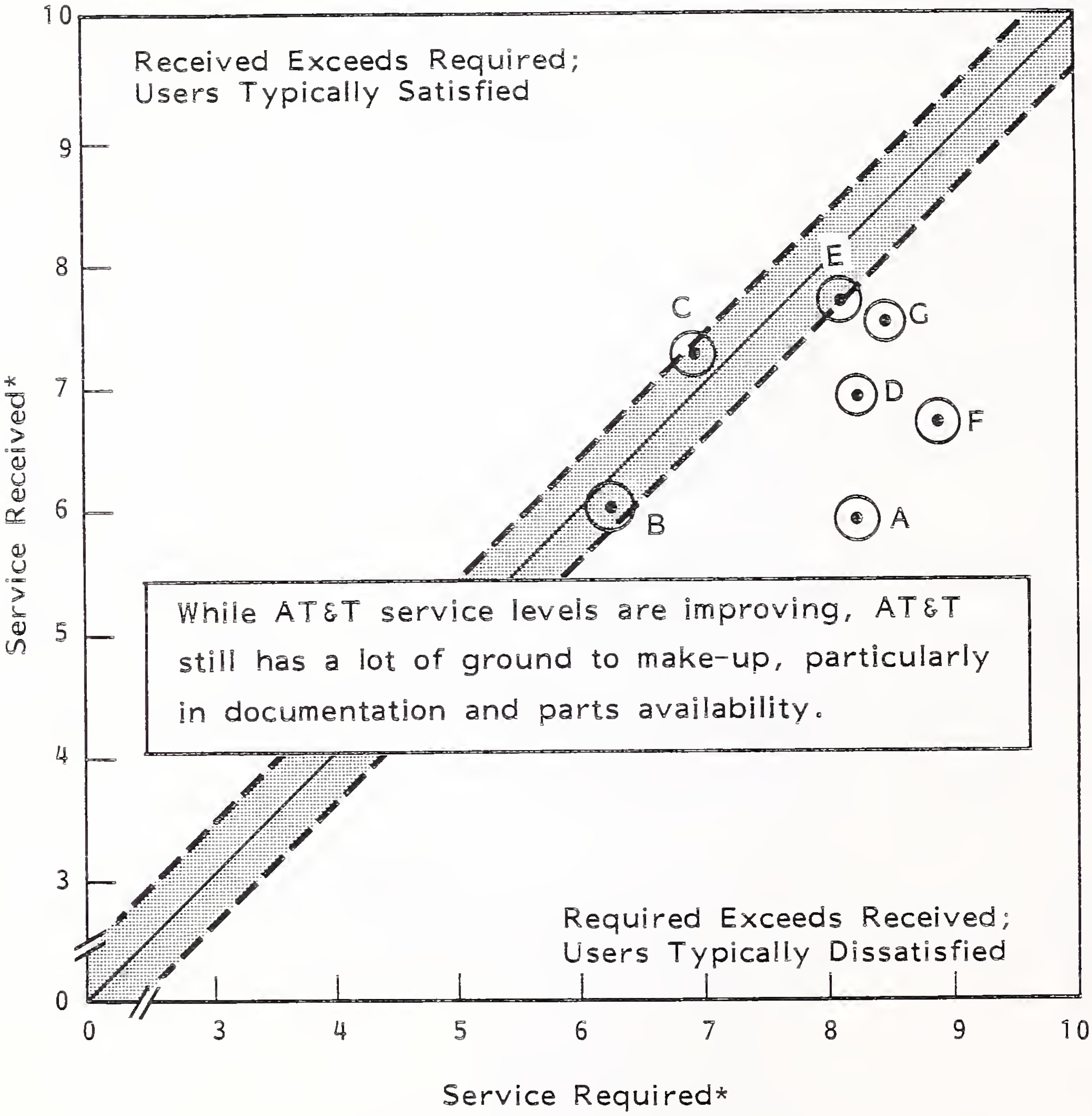


EXHIBIT III-O-4

HARDWARE SERVICES REQUIRED/RECEIVED
AT&T



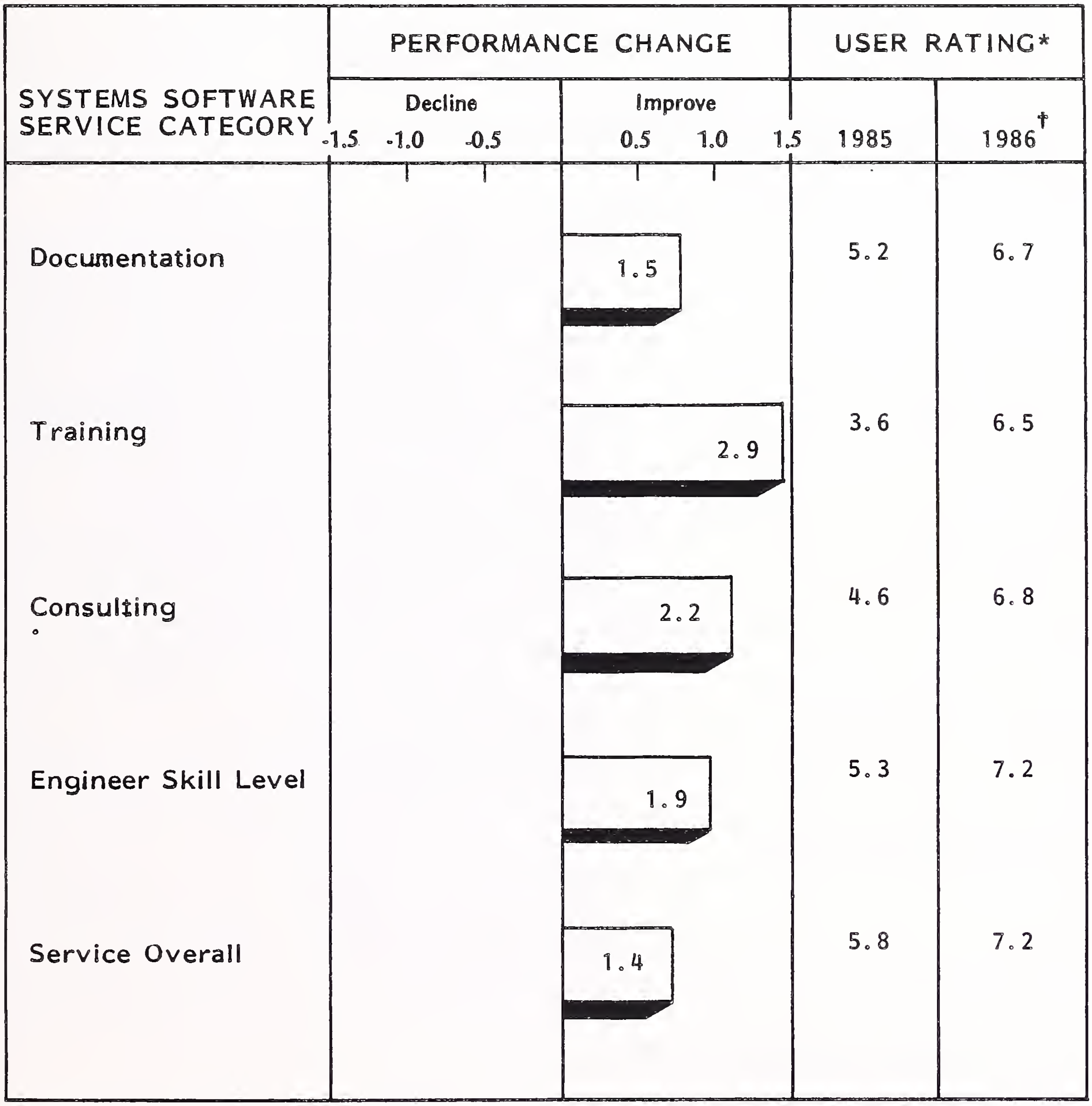
While AT&T service levels are improving, AT&T still has a lot of ground to make-up, particularly in documentation and parts availability.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-O-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
AT&T



SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING*	
		1985	1986†
Documentation	1.5	5.2	6.7
Training	2.9	3.6	6.5
Consulting	2.2	4.6	6.8
Engineer Skill Level	1.9	5.3	7.2
Service Overall	1.4	5.8	7.2

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-O-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
AT&T

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	9.2	6.7	(2.5)
Training	7.4	6.5	(0.9)
Consulting	7.5	6.8	(0.7)
Remote Support	7.9	6.7	(1.2)
Engineer Skill Level	8.7	7.2	(1.5)
Service Overall	8.8	7.2	(1.6)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-O-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
AT&T

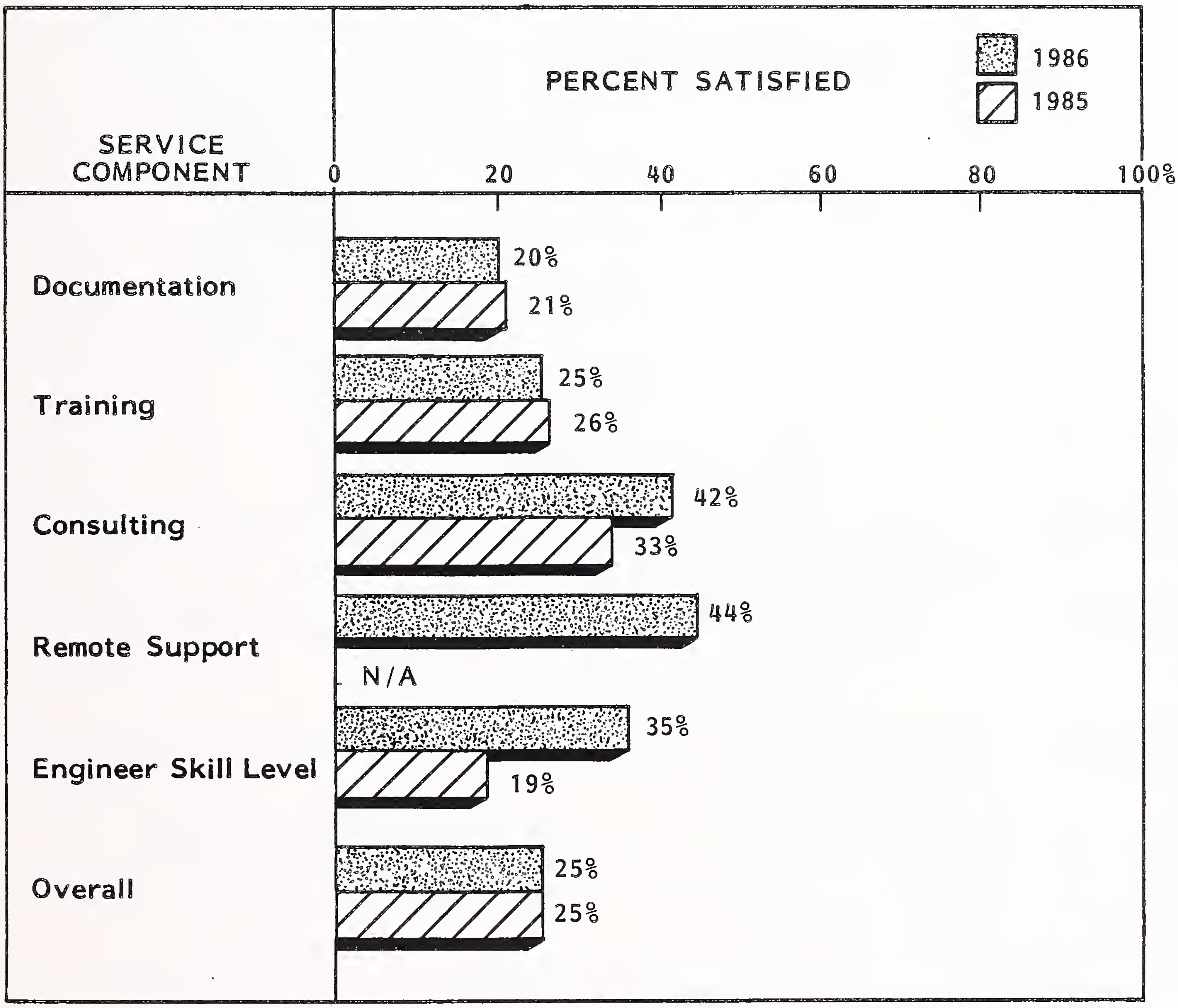
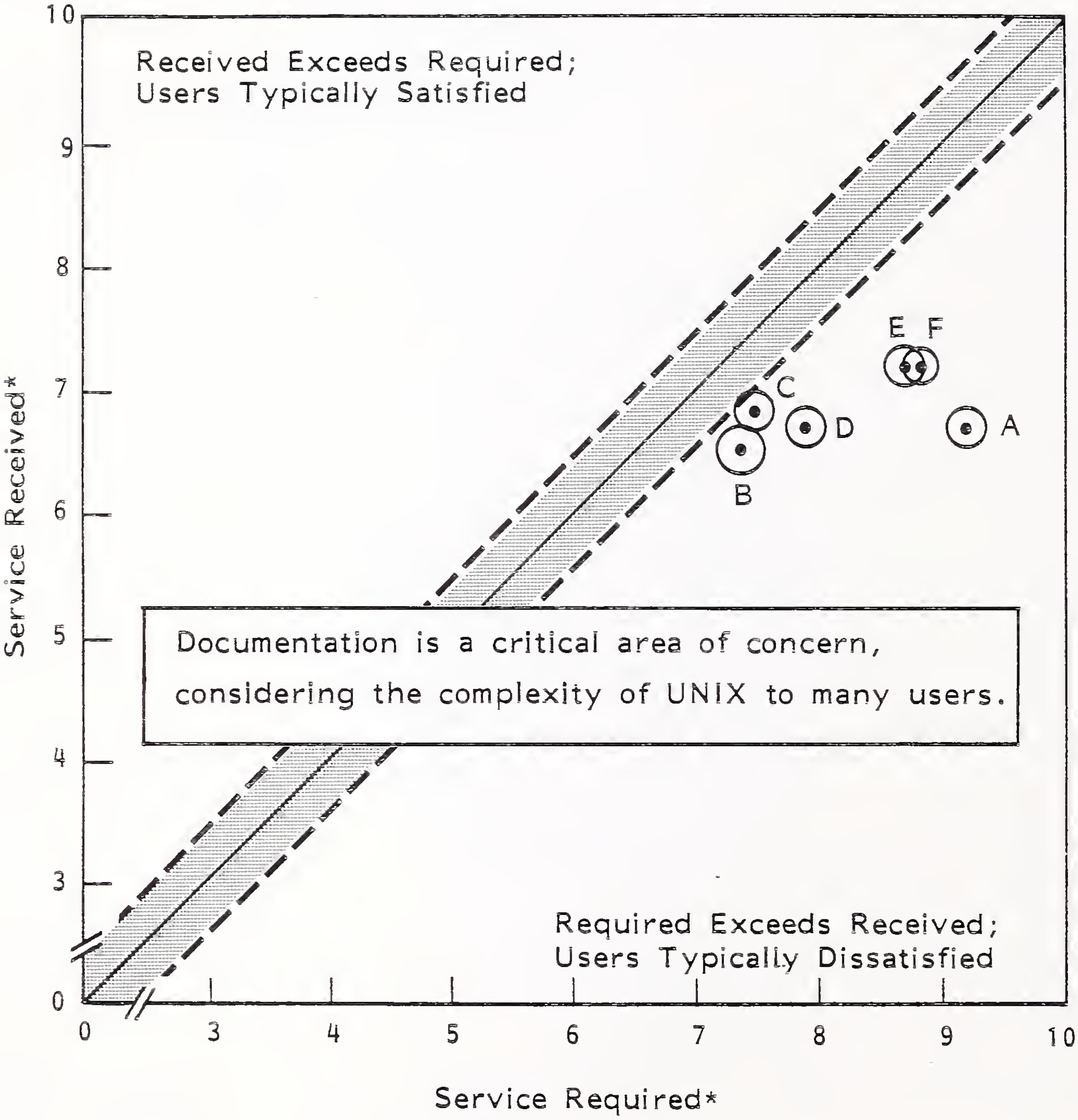


EXHIBIT III-O-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
AT&T



Documentation is a critical area of concern, considering the complexity of UNIX to many users.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-O-9

SERVICE PERFORMANCE
AT&T

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	90.9%	98.7%
Average Number of Interruptions		
Per Month (Number)	4.4	1.6
Percent Hardware Caused	35.0%	52.0%
Percent Software Caused	59.0%	38.0%
Average Hardware Response Time (Hours)	13.4 hr.	6.3 hr.
Average Hardware Repair Time (Hours)	22.3 hr.	7.6 hr.
Average Systems Software Response Time (Hours)	12.5 hr.	13.4 hr.
Average Systems Software Repair Time (Hours)	16.3 hr.	9.4 hr.

- While AT&T has managed to satisfy their 3B users' requirement for system availability, Exhibit III-O-10 indicates that problem resolution turnaround time continues to be of major concern to their users. Users are requiring that hardware problems be resolved within a single day, not by the next day. Also, AT&T's users clearly have perceived a problem in regard to system software support. More accessible spares and improved documentation will help alleviate both of these problem areas.

- Users are initially attracted to AT&T because of the allure of stability and support that AT&T carries with them from the telecommunications side. This is reflected by the users' limited willingness to assume increased responsibility for hardware maintenance or software support, as shown in Exhibit III-O-11. What AT&T should be concerned about is an increase in users who defect to third-party maintenance, since one-fourth of the AT&T user sample are already experienced with TPM, as shown in Exhibit III-O-12.

- Exhibit III-O-13 indicates that AT&T users do not show significant requirement for premium services, even though current service satisfaction is low. Non-prime hour preventive maintenance visits did appear attractive to 70% of the users.

EXHIBIT III-P-10

USER EXPECTATIONS FOR SERVICE PERFORMANCE
AT&T

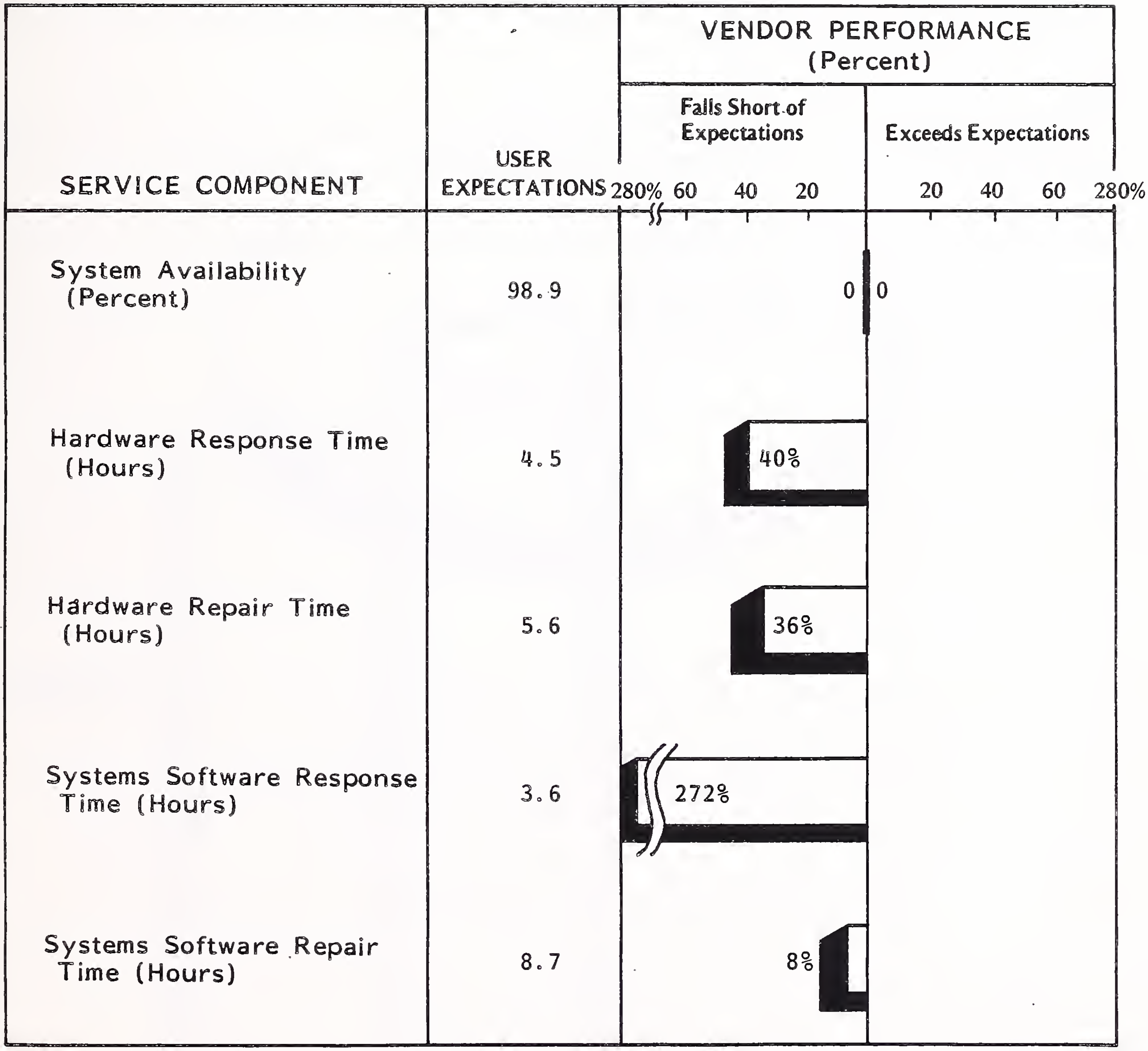
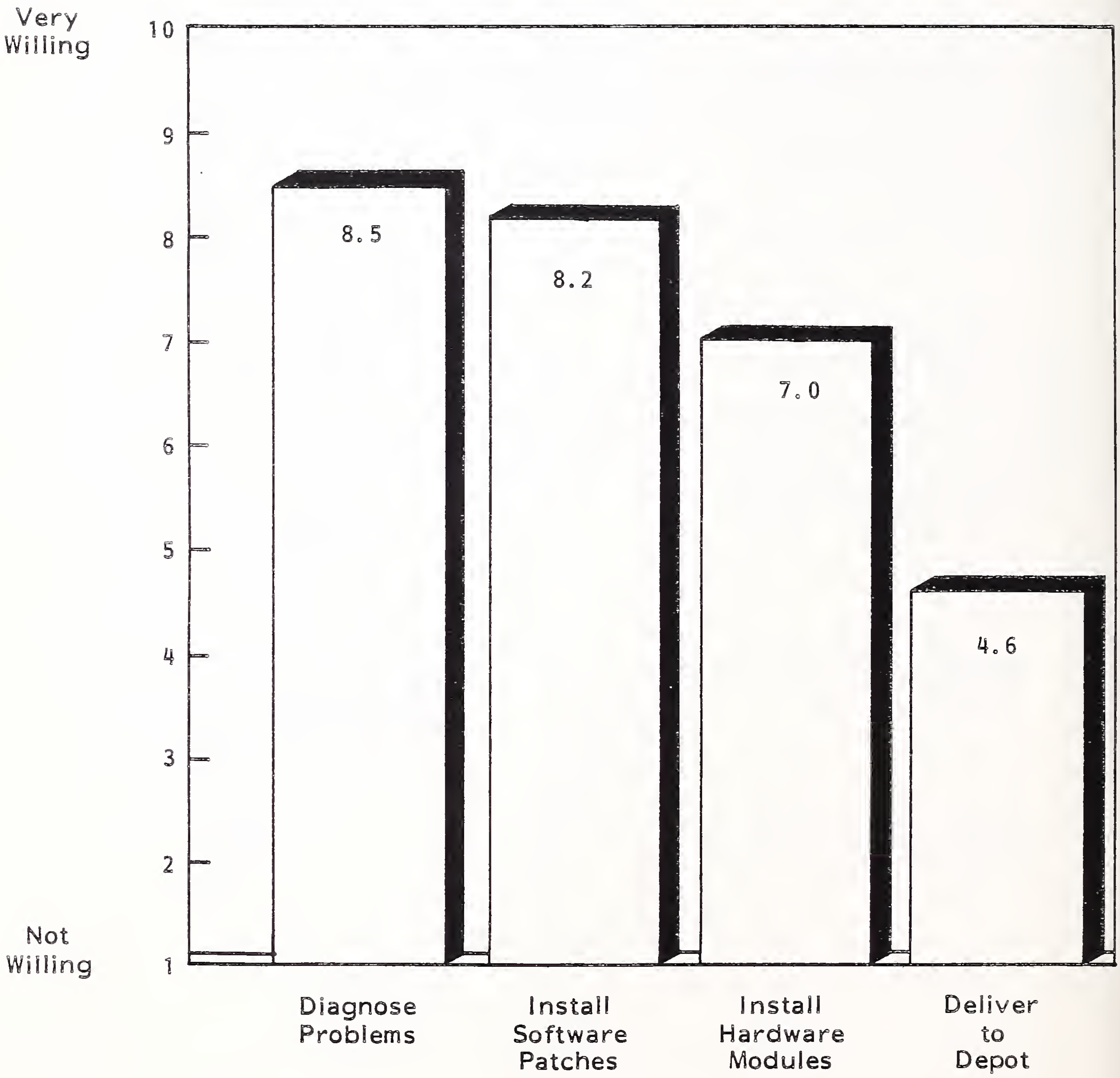


EXHIBIT III-O-11

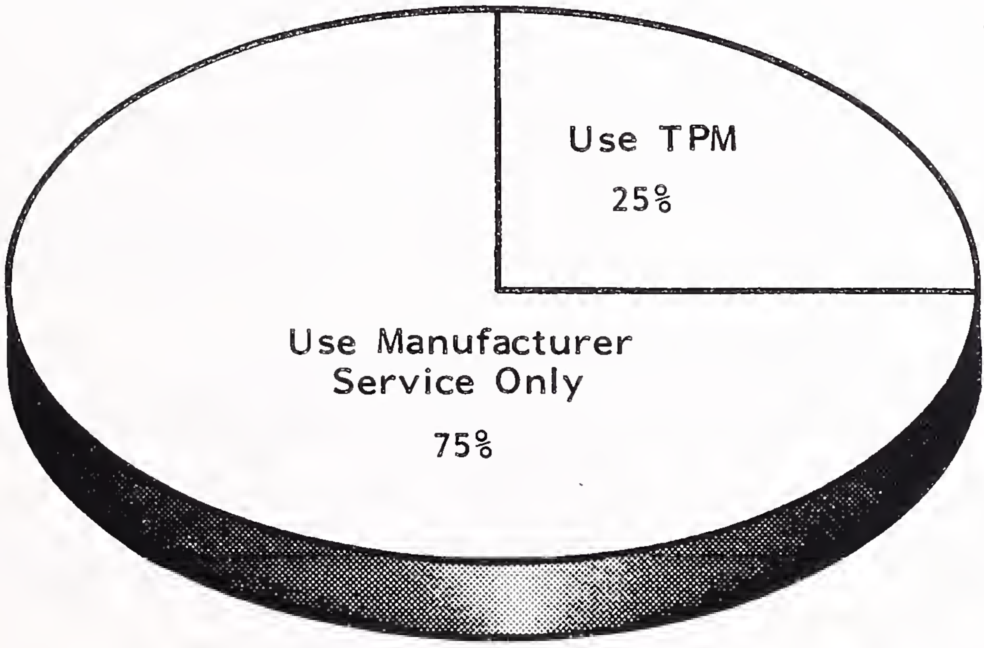
USER WILLINGNESS TO PERFORM MAINTENANCE
AT&T



* Average Standard Error: 0.5

EXHIBIT III-O-12

CURRENT TPM USE
AT&T

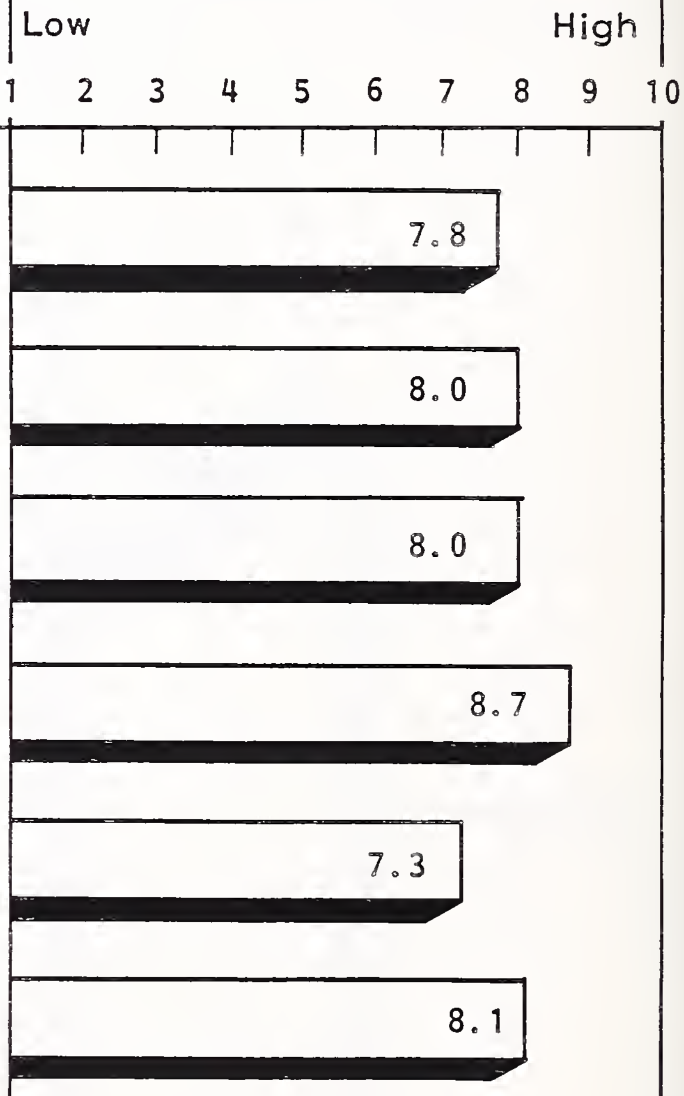


One-fourth of the AT&T sample have experience with TPM. This will grow quickly if AT&T fails to improve service quality.

EXHIBIT III-O-13

USER REQUIREMENTS FOR EXTENDED SERVICES
AT&T

SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT*
Standby Coverage	20%	7.8
Remote Diagnostics	30	8.0
Preventive Maintenance during Non-Prime Hours	70	8.0
Deferred Response	15	8.7
Under Two-Hour Response	45	7.3
Maintenance Management	50	8.1



*Average Standard Error: 0.3

III P. NCR

- In March 1986 INPUT interviewed 25 NCR 93XX superminicomputer users concerning their satisfaction with the level of hardware maintenance and systems software support that they received from their manufacturer. All interviews were performed by telephone and each interview lasted approximately 20 minutes. The NCR 93XX sample was relatively dispersed by industry with 10 of the 13 industry categories represented in the sample. Process manufacturers and educational users each accounted for 16% of the sample; discrete manufacturers, medical, services, and banking users accounting for an additional 12% each of the sample. As always, INPUT targeted directors and managers of data processing as respondents, although four respondents were controllers.

- Exhibit III-P-1 indicates that while NCR superminicomputer users perceived a drop in hardware documentation from 1985 to 1986, these users reported an improvement in key service areas, such as FE skill level and spare parts availability. More over, Exhibit III-P-2 demonstrates that NCR has successfully met or exceeded their superminicomputer user service requirements in virtually all of the hardware service categories analyzed in 1986 (with the exception of hardware documentation). Exhibit III-P-3 supports these findings, with NCR satisfying a high percentage of their users' needs in nearly all areas. Note that the high marks in service satisfaction even carry over into hardware documentation, where NCR still satisfies a majority (64%) of their superminicomputer users. Also note the cumulative effect on overall service satisfaction, where 8 out of 10 NCR 9300 users report satisfactory service. Exhibit III-P-4 graphically demonstrates NCR's success at meeting their superminicomputer user service requirements, particularly in high-requirement service areas.

- NCR's efforts to satisfy their superminicomputer users' software support needs are less successful. Exhibit III-P-5 indicates that NCR's "received"

EXHIBIT III-P-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
NCR

HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE (Decline -1.5 -1.0 -0.5 / Improve 0.5 1.0 1.5)	USER RATING* 1985	USER RATING* 1986†
Documentation	-1.1	7.6	6.5
Training	-0.8	7.2	6.4
Consulting	0	7.5	7.5
Engineer Skill Level	0.4	8.5	8.9
Parts Availability	0.4	7.7	8.1
Service Overall	0.1	8.5	8.6

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-P-2

1986 USER HARDWARE SERVICE RATINGS
NCR

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	7.1	6.5	(0.6)
Training	6.4	6.4	—
Consulting	7.3	7.5	0.2
Remote Support	6.7	7.5	0.8
Engineer Skill Level	8.6	8.9	0.3
Parts Availability	8.3	8.1	(0.2)
Hardware Service Overall	8.5	8.6	0.1

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-P-3

USER SATISFACTION: HARDWARE SERVICE
NCR

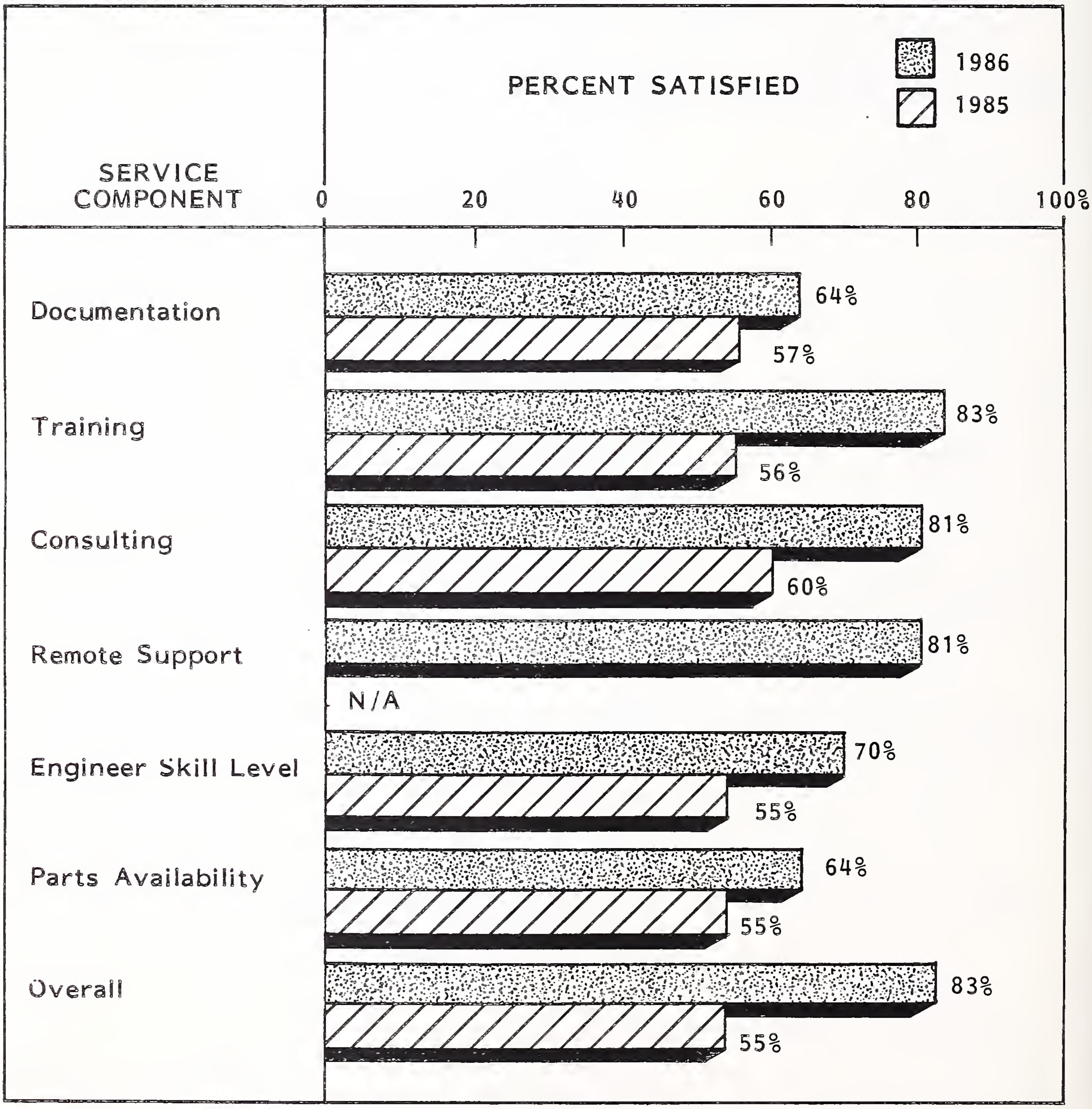
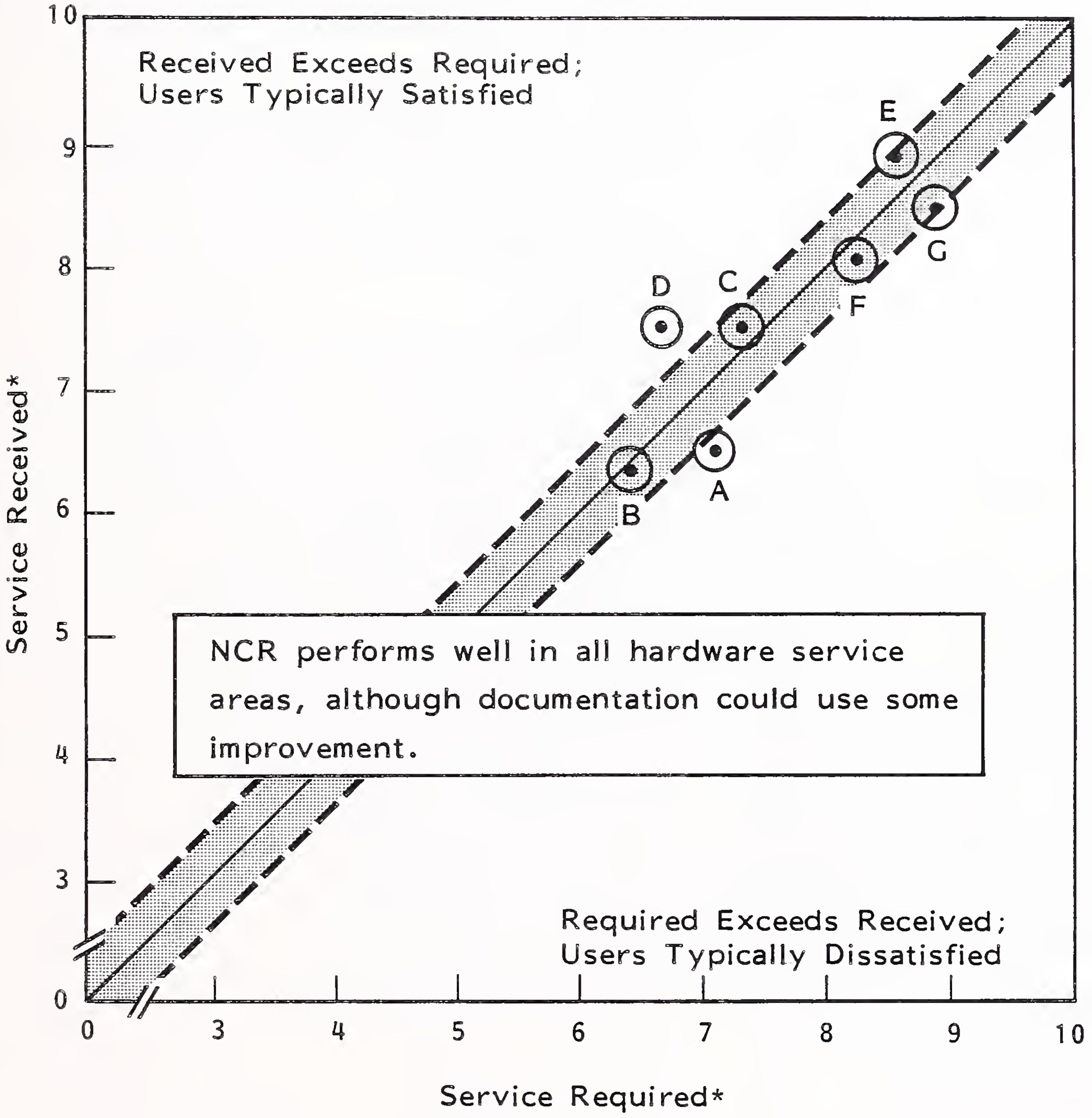


EXHIBIT III-P-4

HARDWARE SERVICES REQUIRED/RECEIVED
NCR



NCR performs well in all hardware service areas, although documentation could use some improvement.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

EXHIBIT III-P-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
NCR

SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE (Decline -1.5 -1.0 -0.5 / Improve 0.5 1.0 1.5)	USER RATING*	
		1985	1986†
Documentation	-0.2	7.2	7.0
Training	0.4	6.6	7.0
Consulting	0.2	7.1	7.3
Engineer Skill Level	0.6	7.4	8.0
Service Overall	0.5	7.3	7.8

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.3

ratings improved slightly in all categories except for documentation. However, Exhibit III-P-6 shows that NCR still does not meet the average "requirement" level in any single service area. While NCR manages to satisfy a large percentage of their users in a few key service areas, such as software engineer skill level (71%), user satisfaction with software training is quite low (only 43% satisfied), as shown in Exhibit III-P-7. Training has a significant effect on overall satisfaction, since NCR superminicomputer users place a higher requirement on training than those of their competitors.

- Still, user satisfaction with NCR system software support is surprisingly high, considering the fact that NCR does not meet any single requirement level for their users, as shown graphically in Exhibit III-P-8.

- NCR service performance benefits from the relatively low service requirements of their superminicomputer users. As shown in Exhibit III-P-9, NCR 9300 users have extremely low system availability requirements (94% versus approximately 97% for their competitors), and extremely slow response and repair time requirements. As a result, NCR satisfies their users' needs in these areas, as indicated in Exhibit III-P-10, while increasing overall satisfaction with both hardware service and software support. Furthermore, NCR superminicomputer service satisfaction is high enough to limit both user requirement for alternative service delivery methods, as shown in Exhibit III-P-11, and third-party penetration into their installed base, as shown in Exhibit III-P-12. User satisfaction with NCR superminicomputer service is also reflected in the relatively large number of NCR users, shown in Exhibit III-P-13, who are attracted to the maintenance management concept, where NCR would act as a single source of service and support.

EXHIBIT III-P-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
NCR

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	8.3	7.0	(1.3)
Training	8.1	7.0	(1.1)
Consulting	7.9	7.3	(0.6)
Remote Support	7.7	7.6	(0.1)
Engineer Skill Level	8.6	8.0	(0.6)
Service Overall	8.5	7.8	(0.7)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-P-7

USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
NCR

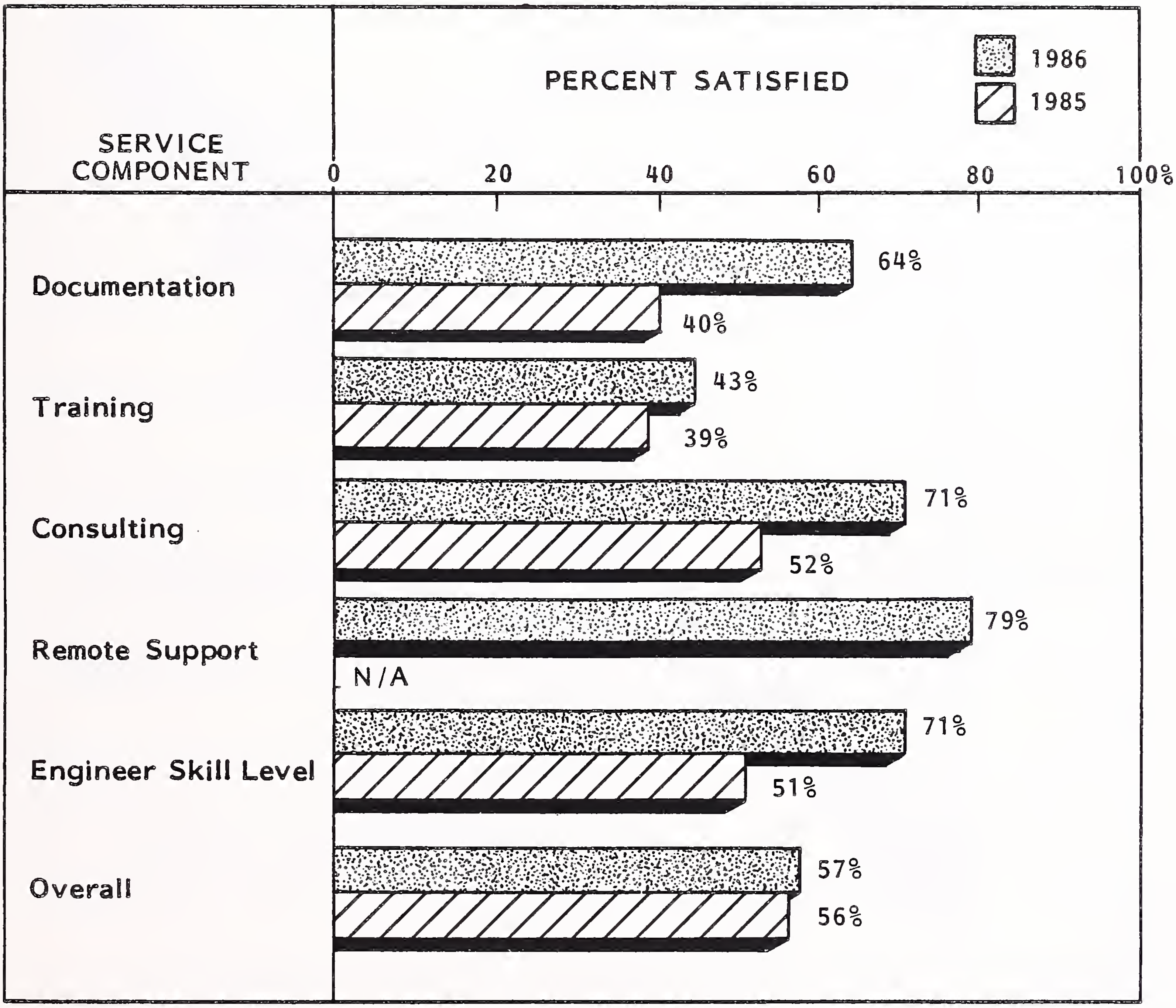
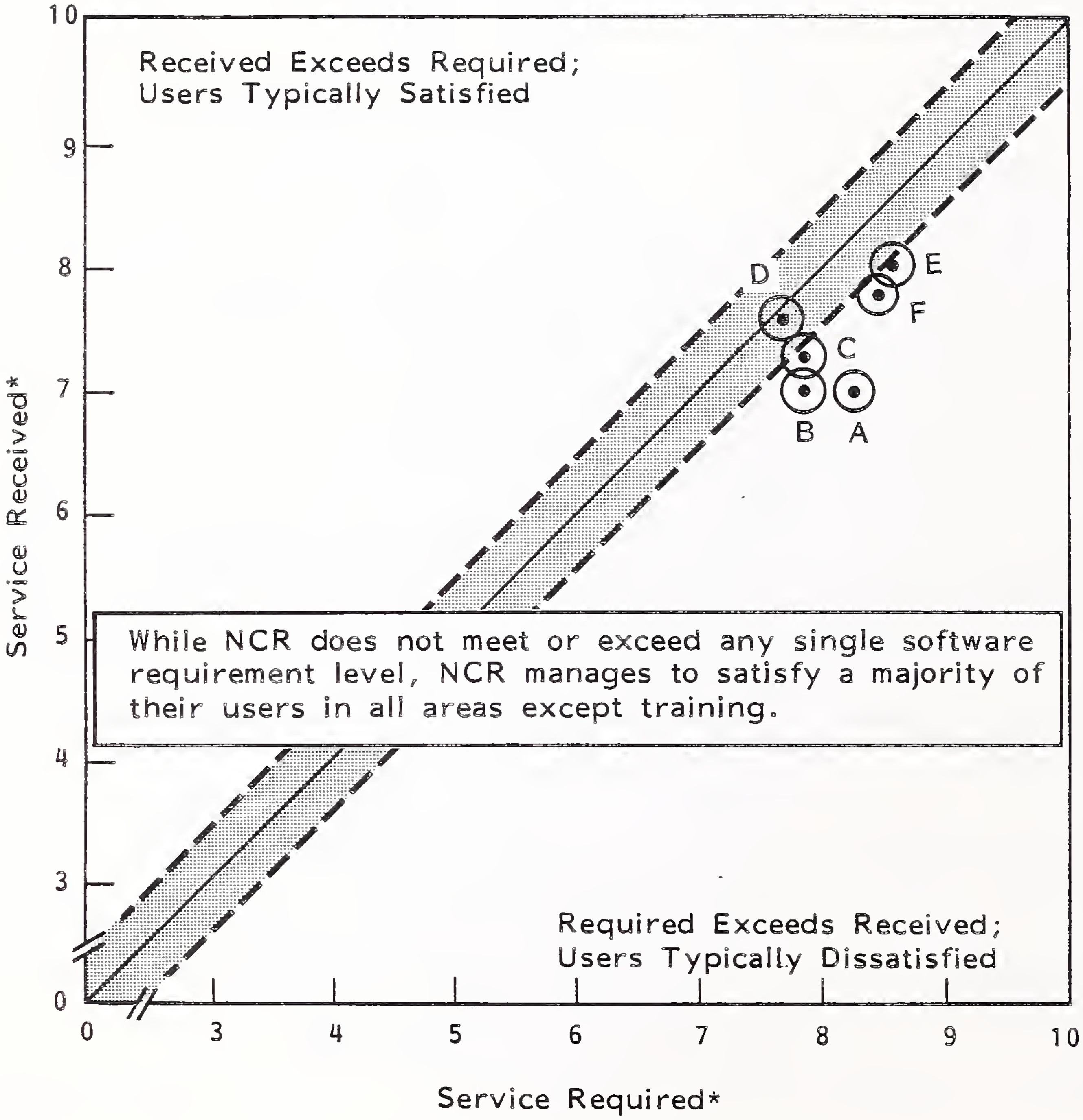


EXHIBIT III-P-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
NCR



While NCR does not meet or exceed any single software requirement level, NCR manages to satisfy a majority of their users in all areas except training.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

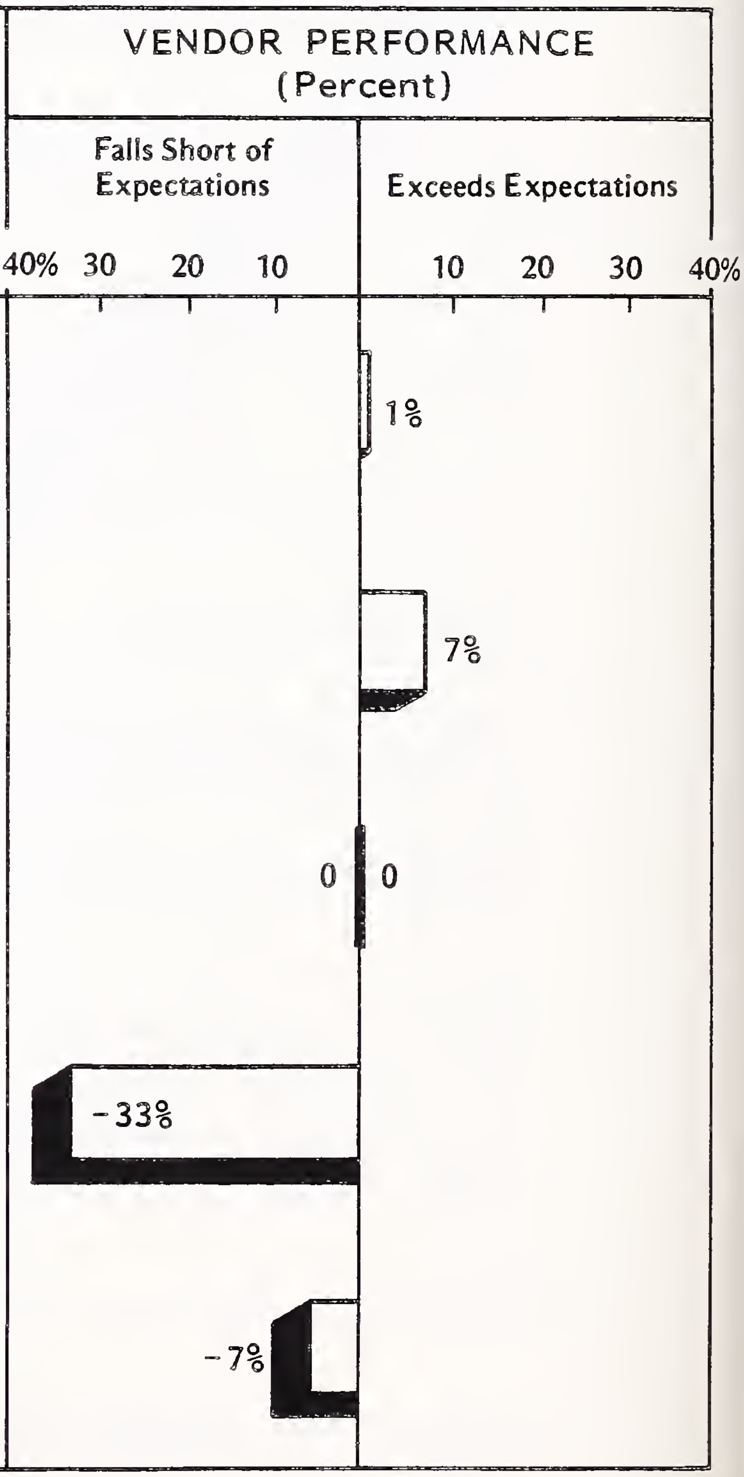
EXHIBIT III-P-9

SERVICE PERFORMANCE
NCR

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	93.5%	93.8%
Average Number of Interruptions		
Per Month (Number)	2.8	1.9
Percent Hardware Caused	50.0%	52.0%
Percent Software Caused	50.0%	27.0%
Average Hardware Response Time (Hours)	5.2 hr.	9.7 hr.
Average Hardware Repair Time (Hours)	2.8 hr.	11.6 hr.
Average Systems Software Response Time (Hours)	7.2 hr.	16.0 hr.
Average Systems Software Repair Time (Hours)	7.5 hr.	21.2 hr.

EXHIBIT III-P-10

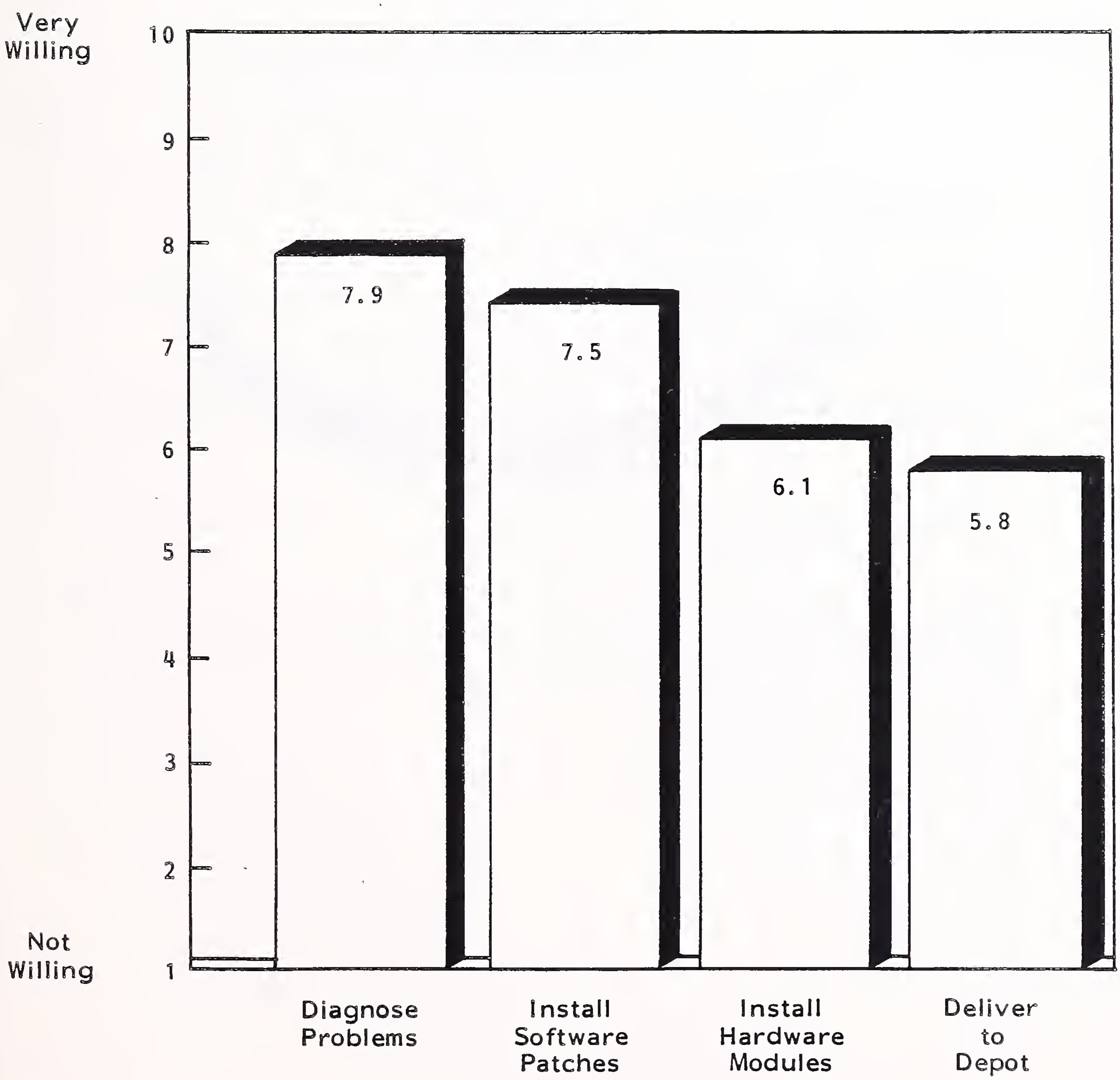
USER EXPECTATIONS FOR SERVICE PERFORMANCE
NCR



SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent)
System Availability (Percent)	92.9	1%
Hardware Response Time (Hours)	10.4	7%
Hardware Repair Time (Hours)	11.6	0
Systems Software Response Time (Hours)	12.0	-33%
Systems Software Repair Time (Hours)	19.0	-7%

EXHIBIT III-P-11

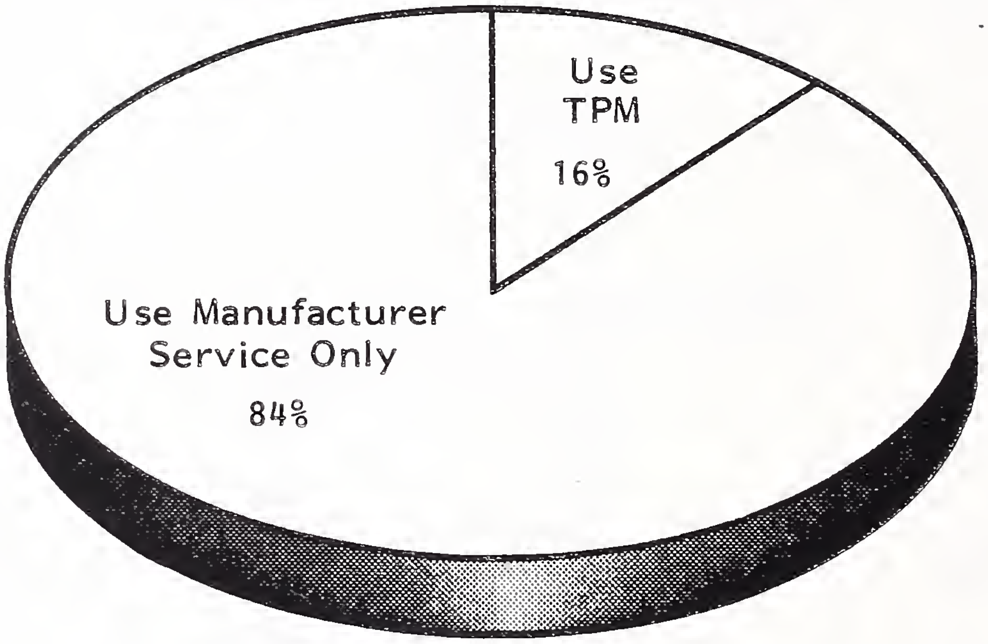
USER WILLINGNESS TO PERFORM MAINTENANCE
NCR



* Average Standard Error: 0.3

EXHIBIT III-P-12

CURRENT TPM USE
NCR

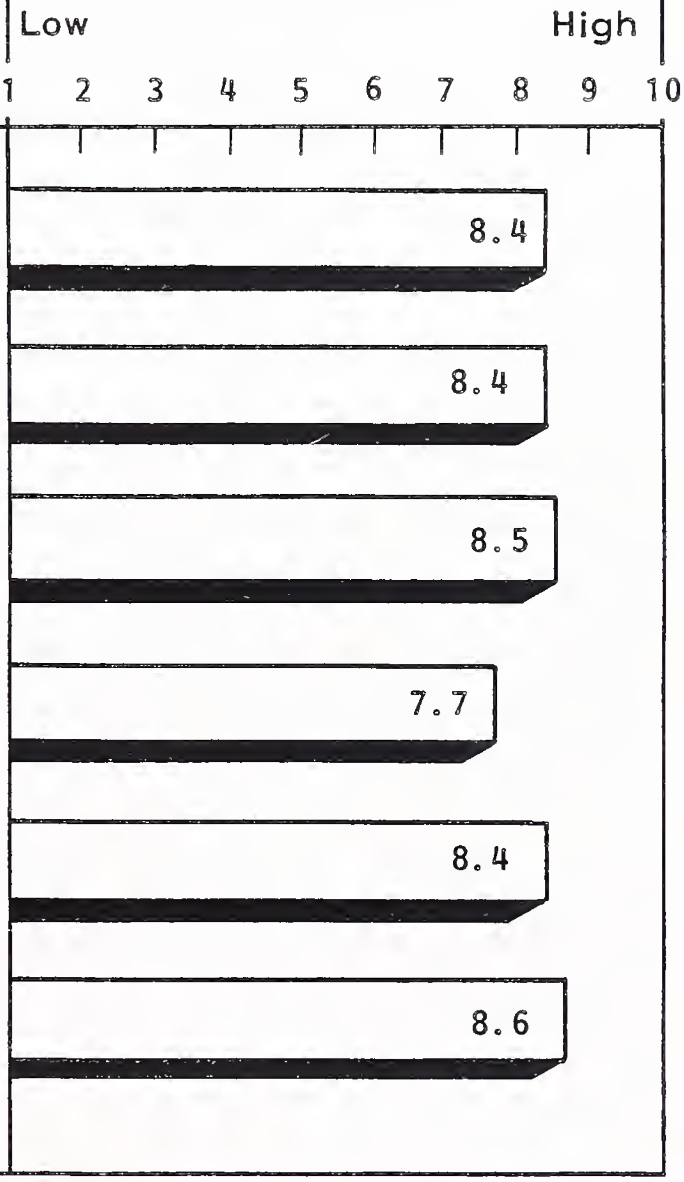


NCR service satisfaction has slowed TPM penetration, however NCR's vertical markets are attractive to TPM.

EXHIBIT III-P-13

USER REQUIREMENTS FOR EXTENDED SERVICES
NCR

SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT*
Standby Coverage	56%	8.4
Remote Diagnostics	64	8.4
Preventive Maintenance during Non-Prime Hours	64	8.5
Deferred Response	44	7.7
Under Two-Hour Response	60	8.4
Maintenance Management	68	8.6



*Average Standard Error: 0.3

III Q. PRIME

- In March 1986 INPUT interviewed 25 Prime 2X5X superminicomputer users concerning their satisfaction with the level of hardware maintenance and systems software support they received. All interviews were performed by telephone and each interview lasted approximately 20 minutes. The 1986 Prime sample was dominated by educational users, who comprised 32% of the Prime sample, and business service users who made up another 25%. Other industries represented include discrete manufacturing, wholesale distribution, federal government, process manufacturing, medical, and utilities.

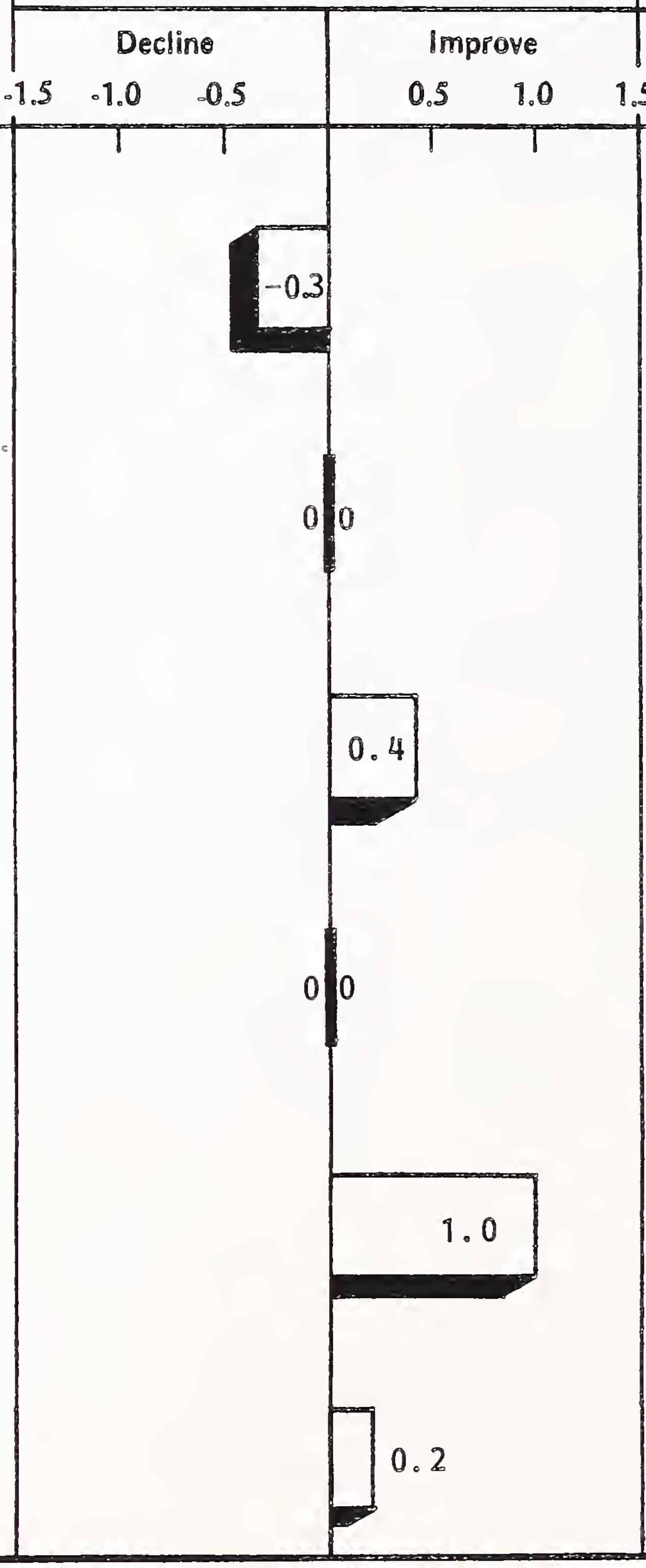
- According to Exhibit III-Q-1, Prime superminicomputer user 1986 ratings for hardware service "received" did not vary much from 1985 marks. What is increasingly evident concerning Prime's superminicomputer user base is an extreme segmentation of user requirements between low priority hardware services and high priority service areas. Exhibit III-Q-2 demonstrates that Prime meets or even exceeds their users' requirements for a number of low priority services, such as training, consulting, and especially remote support, but fails to meet the requirement levels of the high priority service areas of FE skill level, spare parts availability, and overall satisfaction with hardware service. Furthermore, Prime fails to satisfy a majority of their superminicomputer user needs in a large number of service areas.

- Exhibit III-Q-3 demonstrates that only 40% of Prime's superminicomputer users are satisfied with their FE skill level, 40% are satisfied with their service overall, and only 29% are satisfied with their spare parts availability.

- Exhibit III-Q-4 graphically demonstrates the clear segmentation in service priorities that Prime superminicomputer users report. While Prime meets or exceeds the requirements of the low priority services, Prime misses the mark for the higher priority services (FE skill level, parts availability, and hardware service overall). These high priority services have a far greater impact on a

EXHIBIT III-Q-1

HARDWARE SERVICE PERFORMANCE, 1985-1986
PRIME



HARDWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING*	
		1985	1986†
Documentation	-0.3	6.6	6.3
Training	0.0	6.8	6.8
Consulting	0.4	6.8	7.2
Engineer Skill Level	0.0	8.0	8.0
Parts Availability	1.0	6.9	7.9
Service Overall	0.2	8.0	8.2

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-Q-2

1986 USER HARDWARE SERVICE RATINGS
PRIME

HARDWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	6.7	6.3	(0.4)
Training	6.4	6.8	0.4
Consulting	6.6	7.2	0.6
Remote Support	4.8	7.3	2.5
Engineer Skill Level	9.1	8.0	(1.1)
Parts Availability	9.3	7.9	(1.4)
Hardware Service Overall	9.2	8.2	(1.0)

▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.5

EXHIBIT III-Q-3

USER SATISFACTION: HARDWARE SERVICE
PRIME

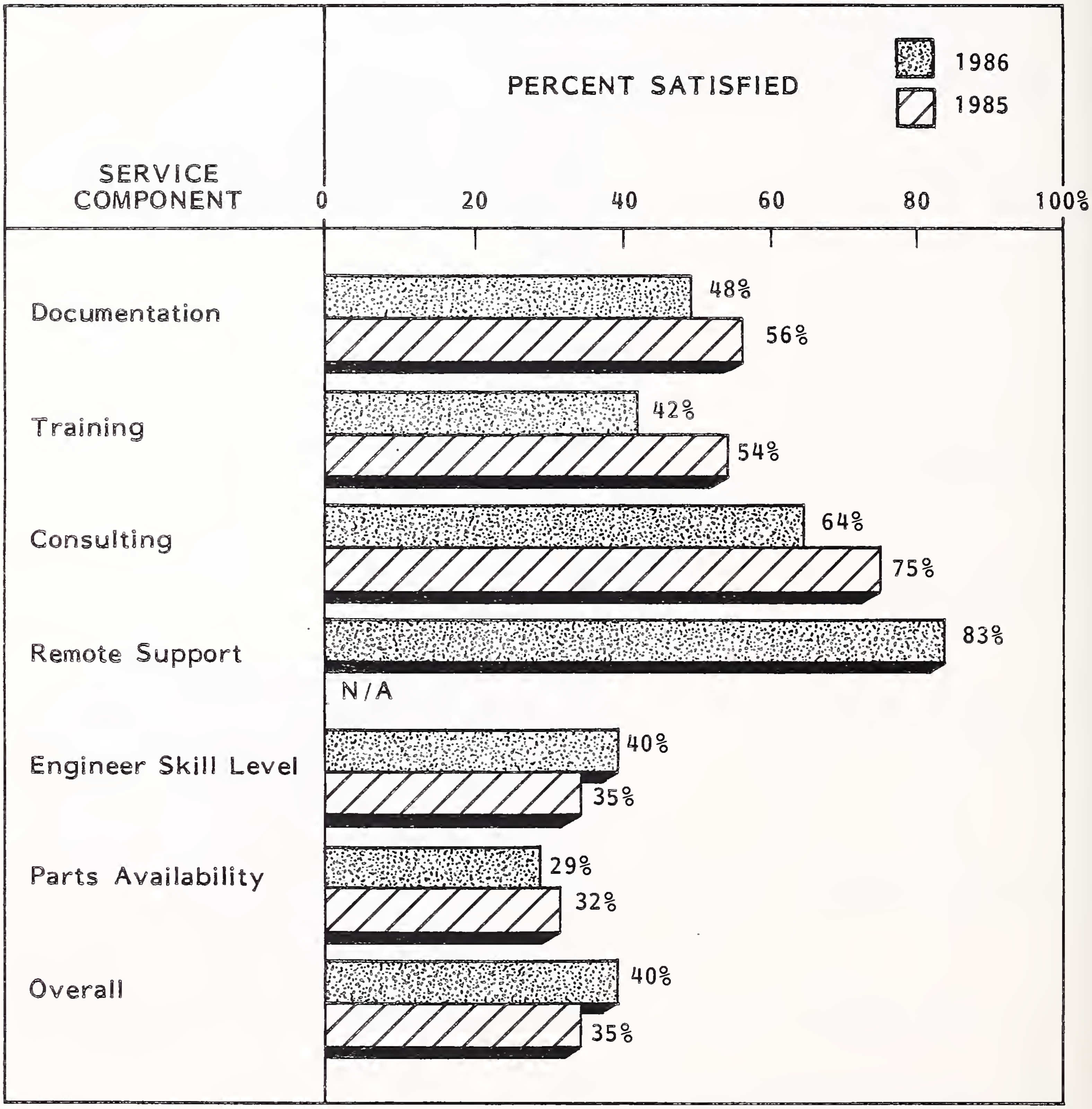
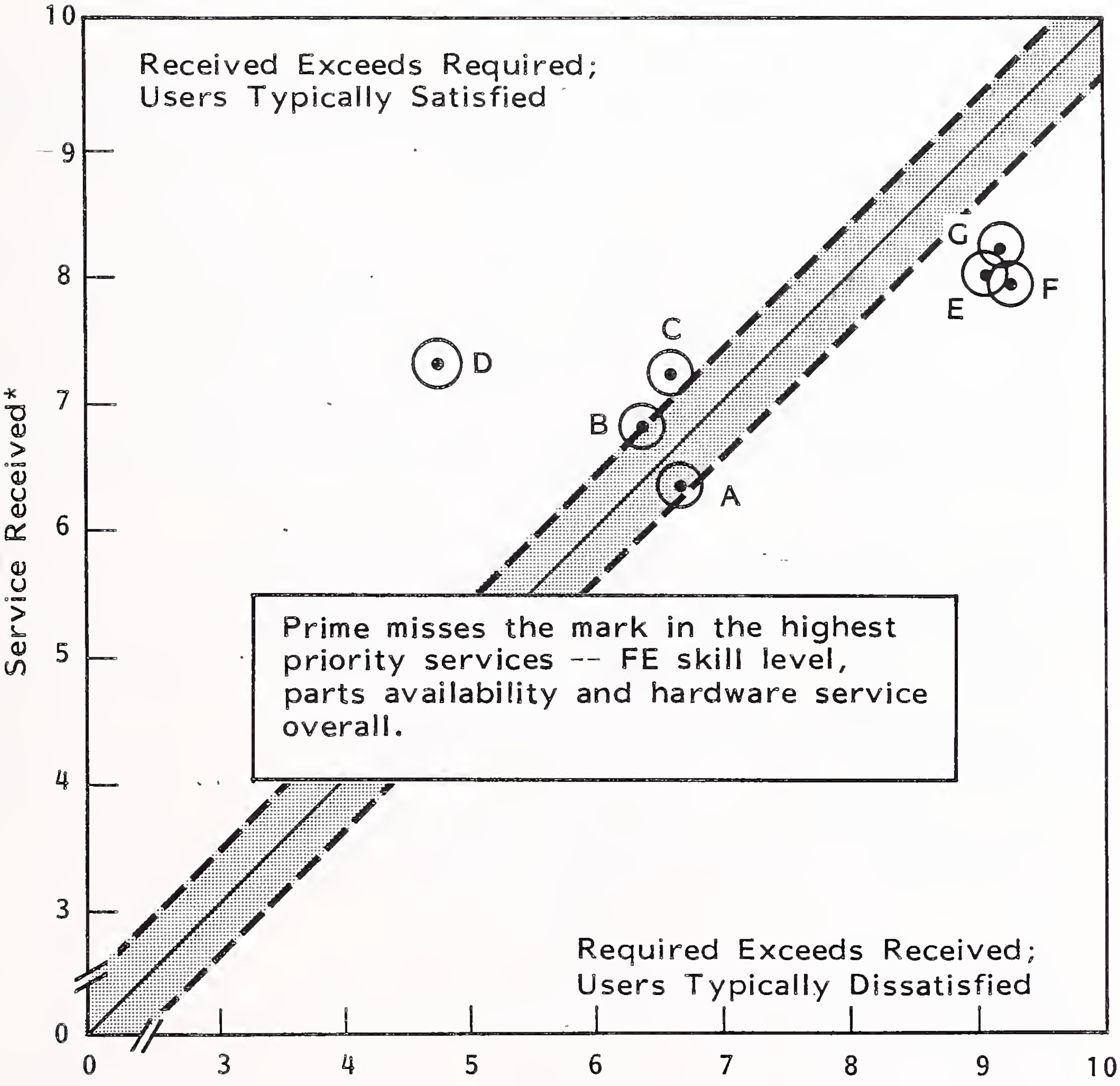


EXHIBIT III-Q-4

HARDWARE SERVICES REQUIRED/RECEIVED
PRIME



A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Parts Availability
G = Hardware Service Overall

* Rating: 1 = Low, 10 = High

user's overall service satisfaction, and, as such, should be an immediate area of concern for Prime.

- Exhibit III-Q-5 shows that Prime's 1986 superminicomputer user ratings for systems software support received also did not vary much from 1985 to 1986. The one exception is software service overall, which dropped from 8.5 to 7.5. Exhibit III-Q-6 helps explain this drop in overall software support satisfaction. First of all, Prime superminicomputer users have extremely high software support requirements in nearly every support category; second, Prime does not come close to satisfying any key software support requirement. Accordingly, Prime succeeds in satisfying a relatively small percentage of their users' system software support needs, as shown in Exhibit III-Q-7. And since the superminicomputer market will become increasingly competitive on the software side, Prime should be extremely concerned about their users' perception of poor service. Exhibit III-Q-8 highlights the gap in user actuals reported versus their requirement levels for system software support.

- Exhibit III-Q-9 indicates that actual service performance, measured by system availability and response and repair times, is similar, if not better (in most areas), than last year's results. Even though user satisfaction with system software support declined, vendor responsiveness improved dramatically. Exhibit III-Q-10 indicates that Prime meets or exceeds the current performance requirements of their users, with the exception of software response time, which is 33% slower than what the Prime users require.

- Perhaps as a reflection of the slower than required software response times received by Prime superminicomputer users, these users are relatively anxious to increase their own participation in software support, as suggested by Exhibit III-Q-11. Prime superminicomputer users seem willing to install software patches when possible, and, to a greater extent, help in the diagnosis of problems. Prime should be able to take advantage of this willingness in attempting to meet the high software support requirements of their superminicomputer users.

EXHIBIT III-Q-5

SYSTEMS SOFTWARE SERVICE PERFORMANCE
PRIME

SYSTEMS SOFTWARE SERVICE CATEGORY	PERFORMANCE CHANGE	USER RATING*	
	Decline -1.5 -1.0 -0.5 / Improve 0.5 1.0 1.5	1985	1986†
Documentation	0.2	6.6	6.8
Training	0.1	6.8	6.9
Consulting	0.0	6.8	6.8
Engineer Skill Level	-0.2	8.0	7.8
Service Overall	-0.5	8.0	7.5

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-Q-6

1986 USER SYSTEMS SOFTWARE SERVICE RATINGS
PRIME

SYSTEMS SOFTWARE SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	Required†	Received†	
Documentation	▨ 9.4	▨ 6.8	▨ (2.6)
Training	▨ 8.1	▨ 6.9	▨ (1.2)
Consulting	▨ 7.8	▨ 6.8	▨ (1.0)
Remote Support	6.5	7.4	0.9
Engineer Skill Level	▨ 9.2	▨ 7.8	▨ (1.4)
Service Overall	▨ 9.3	▨ 7.5	▨ (1.8)

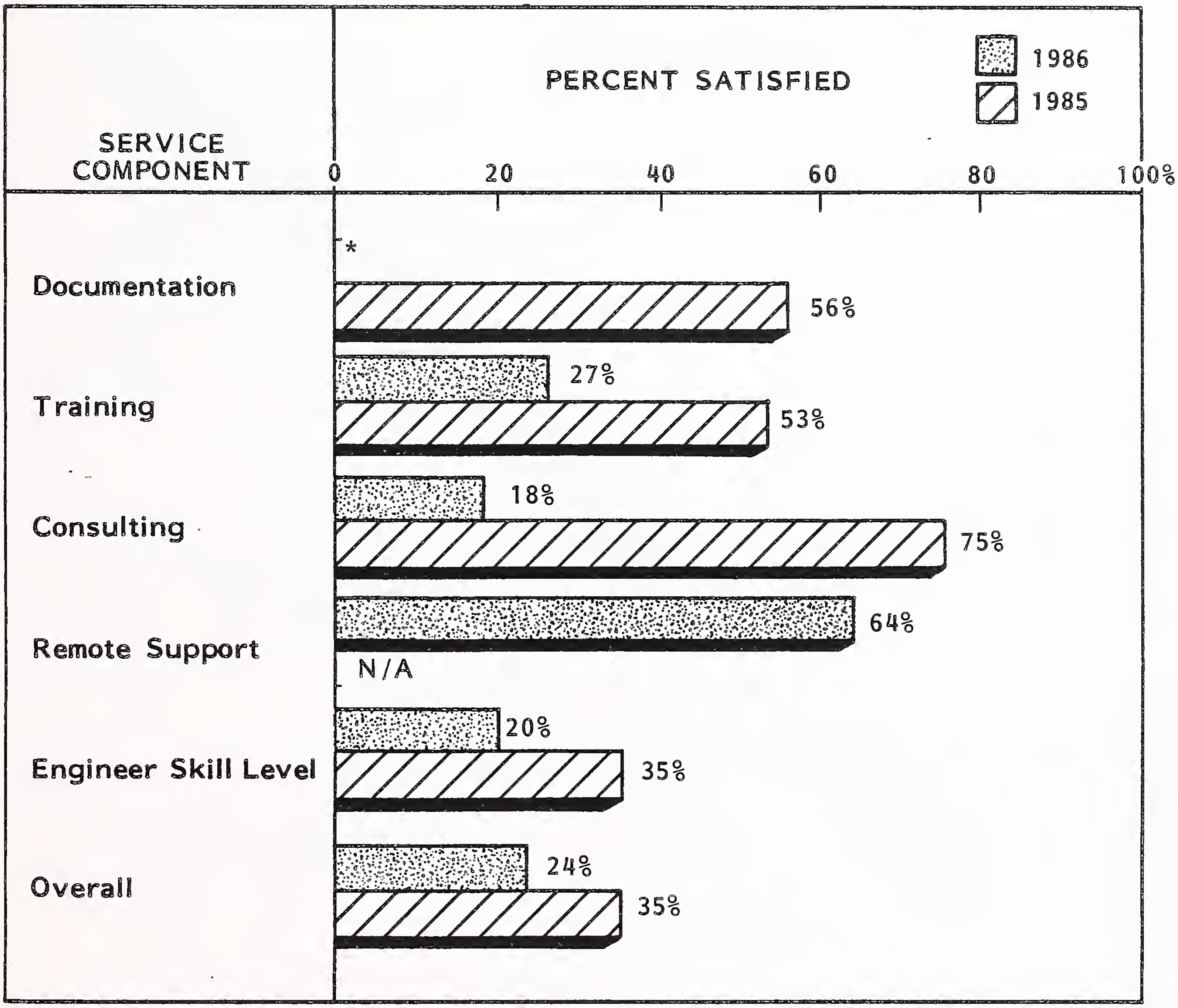
▨ User Expectation Exceeds Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error: 0.4

EXHIBIT III-Q-7

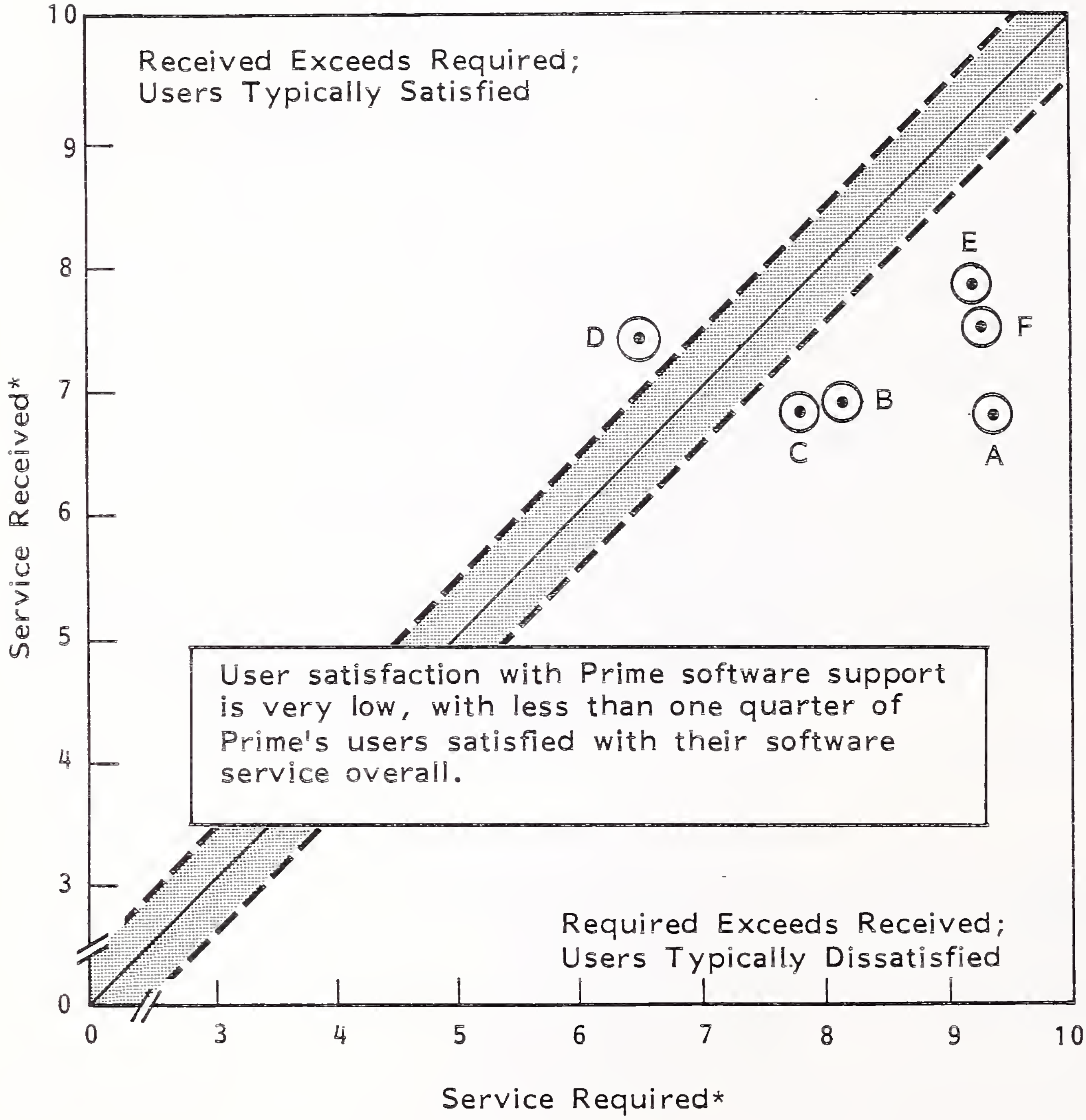
USER SATISFACTION: SYSTEMS SOFTWARE SERVICE
PRIME



*Insufficient response.

EXHIBIT III-Q-8

SYSTEMS SOFTWARE SERVICES REQUIRED/RECEIVED
PRIME



User satisfaction with Prime software support is very low, with less than one quarter of Prime's users satisfied with their software service overall.

A = Documentation
B = Training
C = Consulting
D = Remote Support
E = Engineer Skill Level
F = Software Service Overall

* Rating: 1 = Low, 10 = High

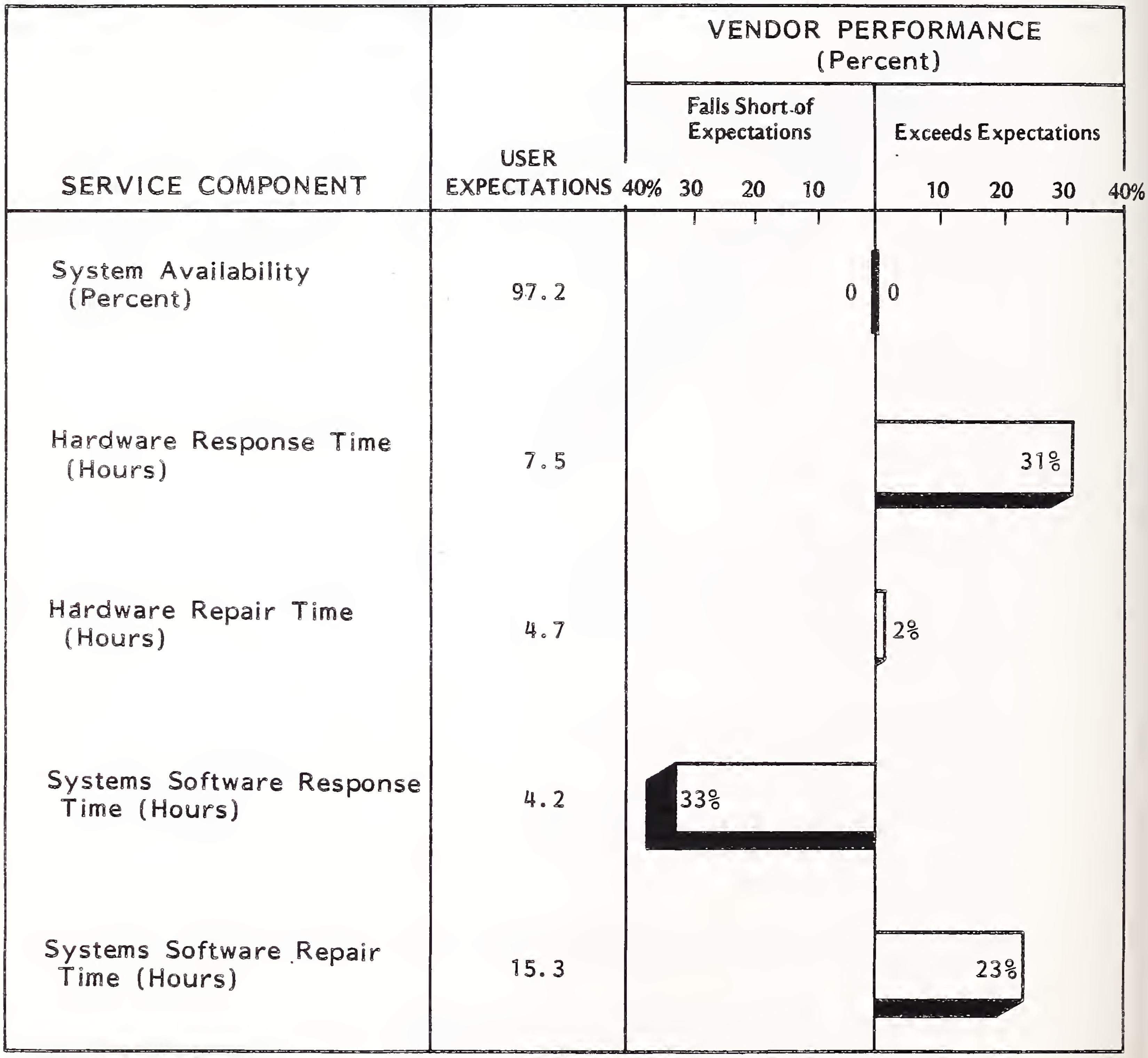
EXHIBIT III-Q-9

SERVICE PERFORMANCE
PRIME

SERVICE COMPONENT	1985	1986
Average System Availability (Percent)	98.3%	98.2%
Average Number of Interruptions		
Per Month (Number)	2.6	1.0
Percent Hardware Caused	44.0%	45.0%
Percent Software Caused	23.0%	11.0%
Average Hardware Response Time (Hours)	3.9 hr.	5.2 hr.
Average Hardware Repair Time (Hours)	4.7 hr.	4.6 hr.
Average Systems Software Response Time (Hours)	7.5 hr.	5.6 hr.
Average Systems Software Repair Time (Hours)	23.0 hr.	11.8 hr.

EXHIBIT III-Q-10

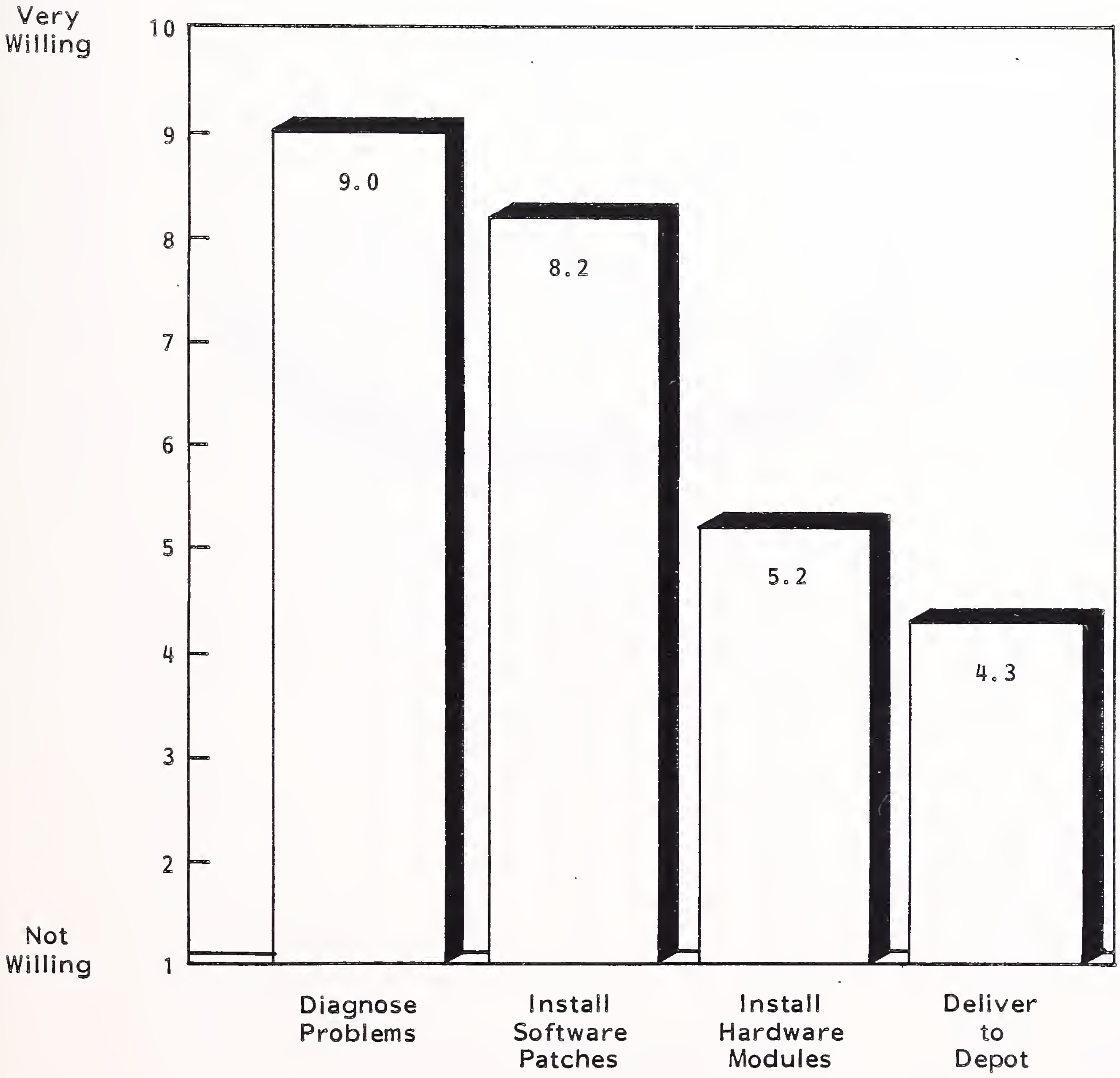
USER EXPECTATIONS FOR SERVICE PERFORMANCE
PRIME



SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE (Percent) Falls Short of Expectations	VENDOR PERFORMANCE (Percent) Exceeds Expectations
System Availability (Percent)	97.2	0	0
Hardware Response Time (Hours)	7.5		31%
Hardware Repair Time (Hours)	4.7		2%
Systems Software Response Time (Hours)	4.2	33%	
Systems Software Repair Time (Hours)	15.3		23%

EXHIBIT III-Q-11

USER WILLINGNESS TO PERFORM MAINTENANCE
PRIME

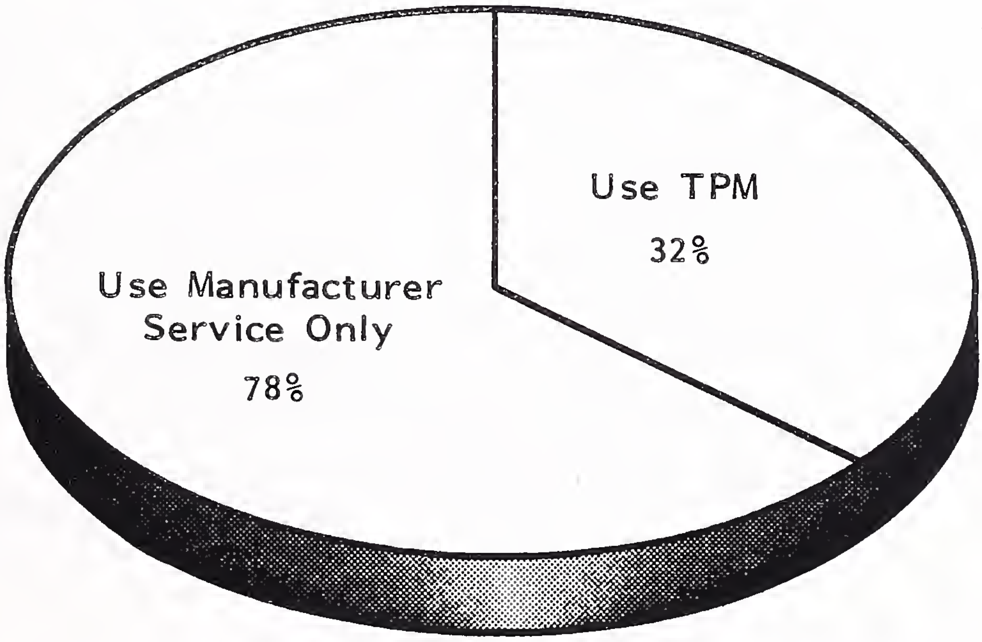


* Average Standard Error: 0.3

- Not surprisingly, a large number of Prime users are experienced with third-party maintenance, as shown in Exhibit III-Q-12. Not all of these users are disgruntled customers, since a significant number of Prime users also use non-Prime peripherals in their systems. Exhibit III-Q-13 demonstrates an extremely large percentage of Prime users who are attracted to the maintenance management (single source) concept.

EXHIBIT III-Q-12

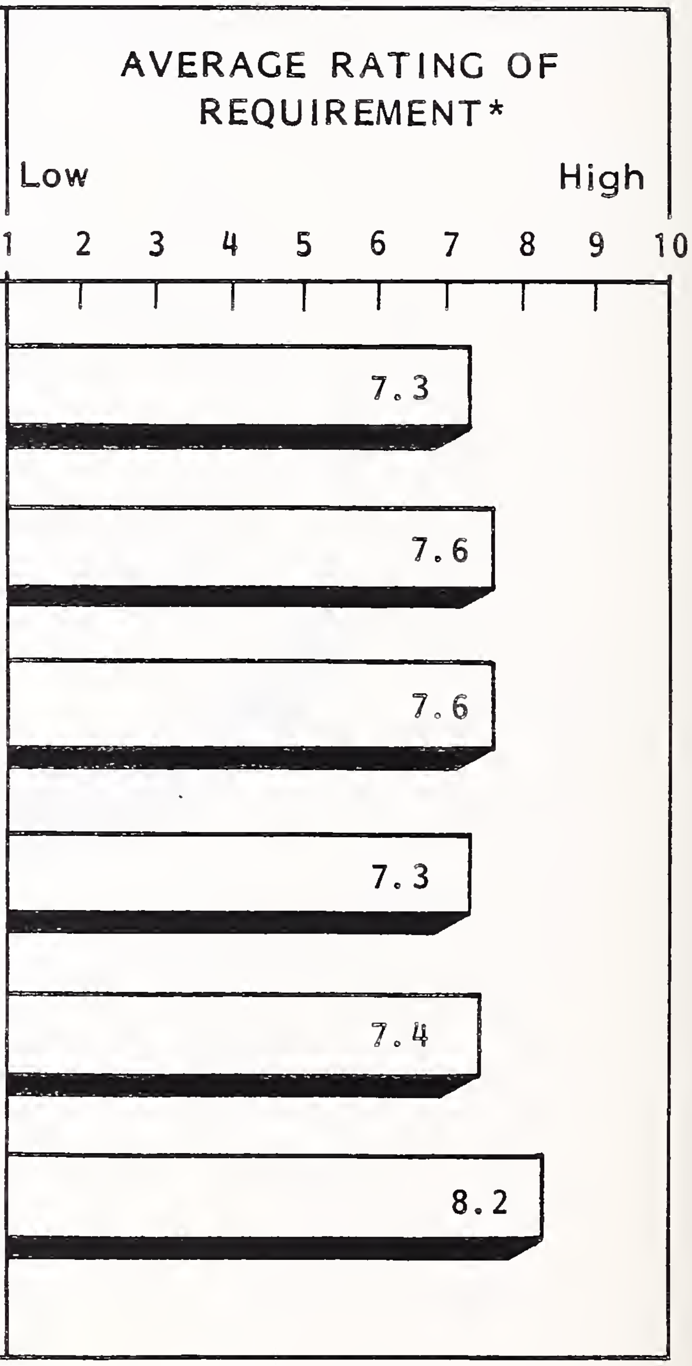
CURRENT TPM USE
PRIME



Almost one-third of Prime's users are experienced with third-party maintenance.

EXHIBIT III-Q-13

USER REQUIREMENTS FOR EXTENDED SERVICES
PRIME



SERVICE CATEGORY	USERS REQUIRING EXTENDED SERVICES (Percent)	AVERAGE RATING OF REQUIREMENT* Low High 1 2 3 4 5 6 7 8 9 10
Standby Coverage	40%	7.3
Remote Diagnostics	44	7.6
Preventive Maintenance during Non-Prime Hours	44	7.6
Deferred Response	12	7.3
Under Two-Hour Response	28	7.4
Maintenance Management	72	8.2

*Average Standard Error: 0.3

IV LARGE SYSTEMS SERVICE VENDOR PROFILES

- In this section, INPUT presents profiles of the leading large systems equipment manufacturers' service organizations. Each profile begins by providing a brief history and description of the company, including a discussion of current news items relating to service. Next, demographic data about each service organization is provided, including an analysis of both company and service revenue trends over the past five years. This analysis is followed by a description of the actual service delivery for each company, including hardware maintenance, software support, education services, and professional services. Finally, each profile provides a brief discussion of service directions for each company.

SERVICE VENDOR PROFILE

AMDAHL CORPORATION
1250 East Arques Avenue
Sunnyvale, CA 94088

President and CEO: John C. Lewis
President and COO: E. Joseph Zemke
Senior Vice President, Sales, Marketing, Communications Products and Services: Joseph J. Francesconi
Vice President, Product Support and Services: William Ferone
Revenues, Fiscal Year 1985: $862 Million

BACKGROUND

- Amdahl designs, manufactures, markets, and services large scale general purpose computer systems and related peripherals, software communications products, and educational products. The products are architecturally compatible at specific hardware and software interface levels with competing IBM computer systems, hence, Amdahl is known as an IBM plug-compatible vendor. Along with IBM, other significant competitors of Amdahl in this market are NAS and Trilogy Systems on the mainframe side, and NAS, Storage Technology, Control Data Corporation, and Memorex Corporation in the peripherals market.

- Amdahl installed its first system, the 470 V/6, in June 1975. Ten years later, Amdahl has grown to become a $862 million company, taking a 3% share of the 1985 mainframe market (IBM still holds a 61% share of that market). And while U.S. computer sales have been sluggish in this high end of the computer market, Amdahl has been optimistic that its newest machine, the 3090-compatible 5890, will spark computer sales for it. Amdahl has already installed six dual processor 5890-300s and expects to ship between 5 and 15 more than anticipated by year end due to an accelerated shipment schedule.

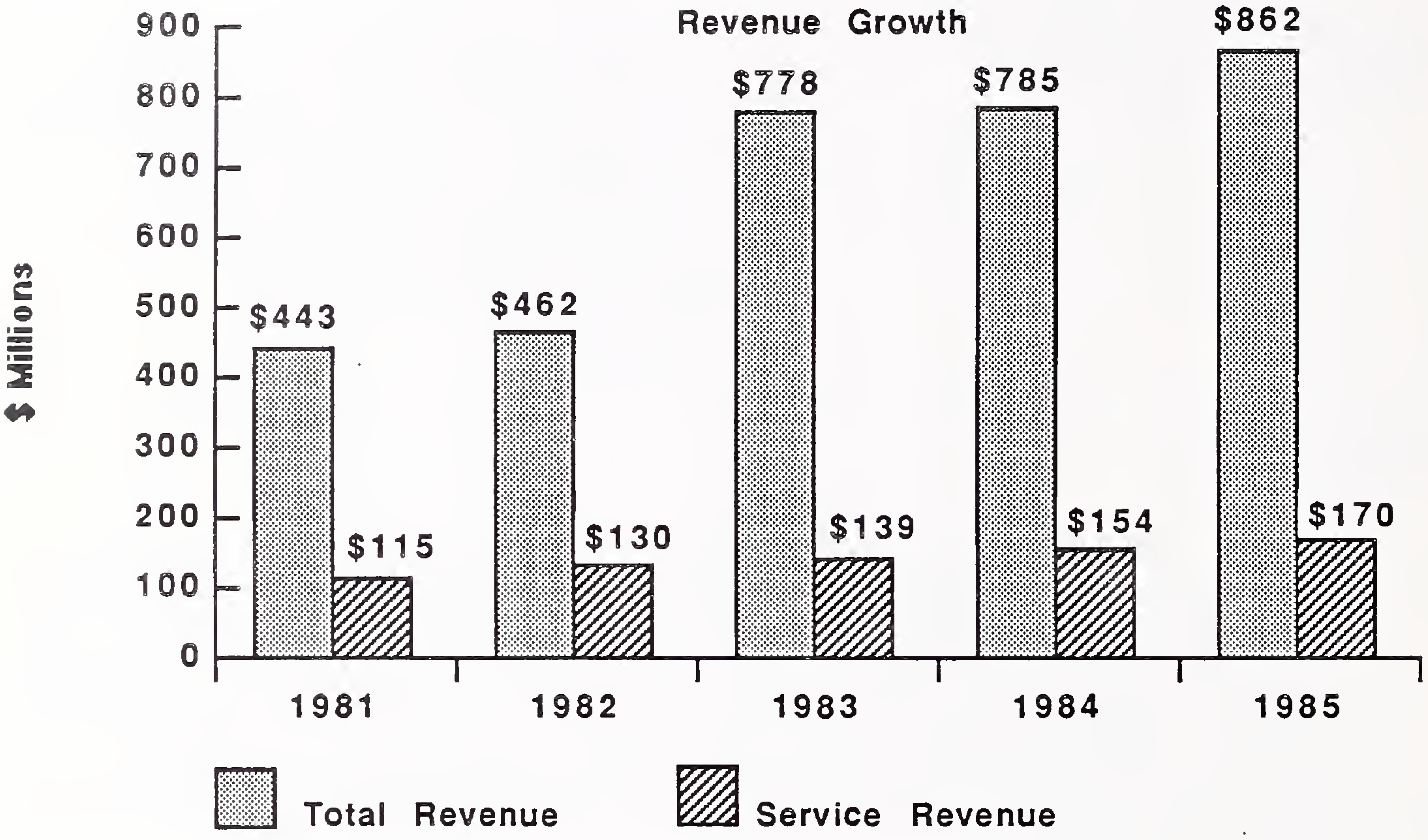
- This parallel-processing market has become very competitive, however. IBM got the jump in this high end by introducing the first of its Sierra models ten months earlier than Amdahl. Early in 1986, IBM announced a downward extension of its 3090 family and price cuts of existing 308X and 309X products, prompting Amdahl to respond with price cuts of its own. And the market became even more crowded with the introduction of NAS' new AS/XL Vector series.

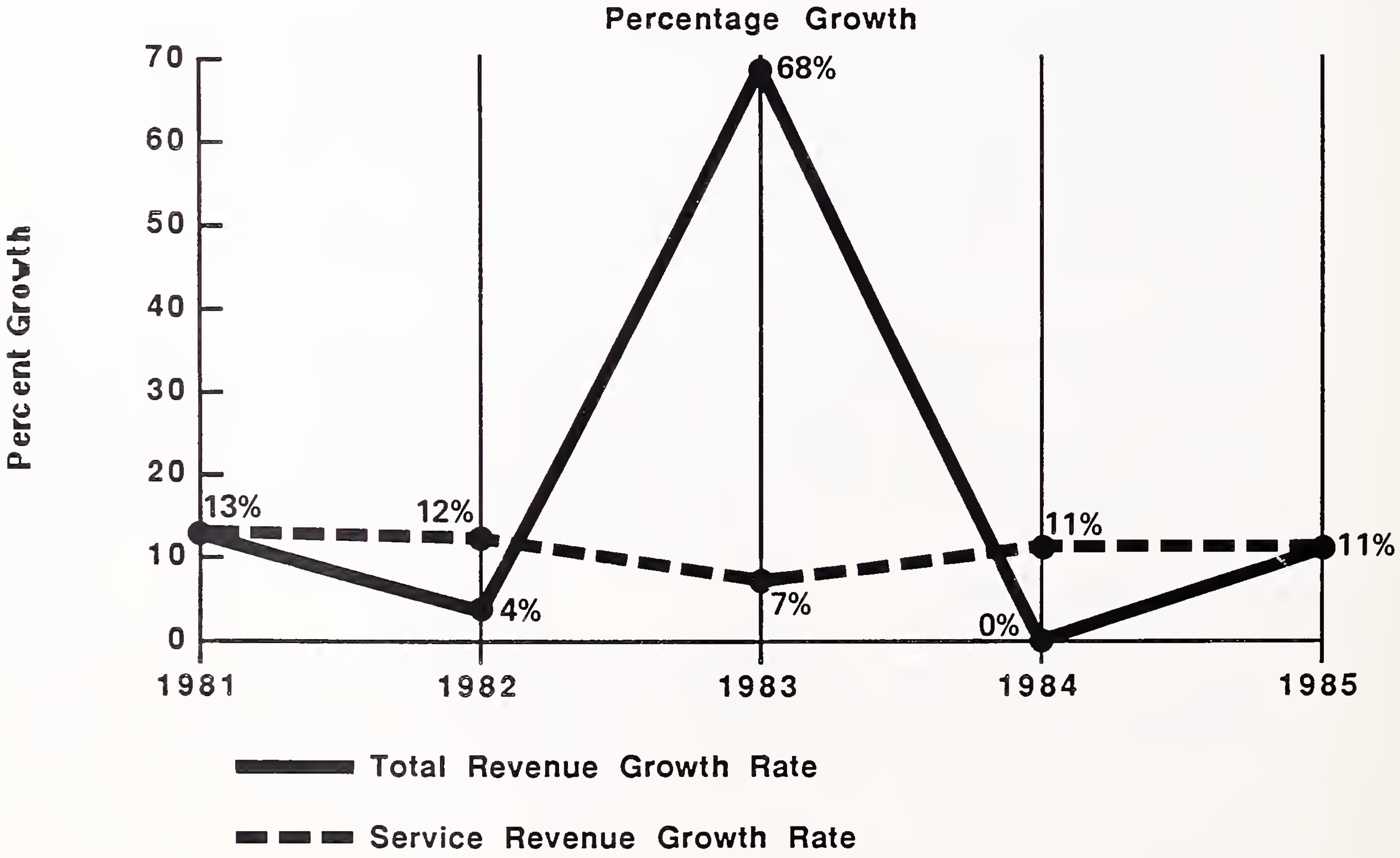
SERVICE DEMOGRAPHICS

- INPUT estimates that Amdahl service revenue was $170 million in 1985, representing an 11% growth rate over 1984 (see Exhibit IV-A-1). While product shipments should continue to rise, INPUT expects that service growth

EXHIBIT IV-A-1

AMDAHL'S REVENUE AND PERCENTAGE GROWTH





will continue to exceed revenue growth due to increased efficiencies in the provision of service. Improved reliability, along with competitive pricing, should tend to temper this growth.

- Currently, Amdahl employs approximately 1,300 people worldwide in service, with 1,000 in the U.S. Of this U.S. total, approximately 750 people are employed as either hardware engineers or software support specialists. Amdahl's advanced use of remote diagnostics should keep its engineer population relatively constant.

SERVICE DELIVERY

- Service customers of Amdahl maintenance receive around-the-clock coverage under their normal contract. In most cases, the user contacts either the 24-hour support center or an alert center (which acts as a message center). Amdahl also releases the phone numbers of specific FEs in certain situations. And while Amdahl does not contractually guarantee or specify response times, Amdahl users have reported that actual response times have consistently been one hour or less for the last three years.

- Part of Amdahl's success in providing service and support is its development in remote support services. Amdahl utilizes a worldwide remote support network called AMDAC (Amdahl Diagnostic Assistance Center) that is accessible by all Amdahl equipment. Both hardware and software problems can be isolated, diagnosed, and corrected through this system. In addition, each Amdahl system has a console processor that facilitates on-site diagnostics, helping to minimize system downtime.

- Software support is handled from the same regional support centers as hardware support. Using an on-line symptom search data base supplemented by the remote support provided by AMDAC, Amdahl customers can expect prompt recovery from software problems, even though Amdahl, as a PCM, does not supply either systems or applications software. In addition, Amdahl encourages the cross-training of FEs (over 25% of Amdahl's staff is cross-trained), and most Amdahl FEs are trained to some extent on diagnosing software problems.

- Amdahl systems, by design, are comprised of fewer but more expensive discrete components. Therefore, Amdahl is very concerned about spare parts inventory control. Spare parts control is an integral part of Amdahl's dispatching and remote diagnostics network using a nationwide air freight carrier (Consolidated Freightways "CF Air") to stock and ship spare parts out of 20 air freight depots throughout the U.S. Amdahl guarantees two-hour delivery of spares to the user's site. In addition, Amdahl stores spares at local service offices.

- Escalation is also an integral part of Amdahl's computerized service management system. If a system remains down for a specified two, four, or eight hours, technical assistance is directed to headquarters and the field manager and then a regional manager are notified. In addition, problem escalation occurs if two unexplained intermittent problems occur in any 30-day period.

- Amdahl makes available certain professional services through its Technical Consulting group. In addition to free services such as site, environmental, and installation planning, Amdahl provides customized services in such areas as performance measurement and tuning, capacity planning, systems management, and data base design review. Many of these services are free, depending on the scope of the effort.

- Amdahl also makes a wide range of educational services available to both Amdahl and non-Amdahl customers. Amdahl offers seminars and training classes out of several Education Centers located in the U.S., Canada, and Europe. Users can request specially designed training courses to meet specific needs in the areas of both usage and support. In addition, Amdahl provides technical support offerings in such diverse areas as VTAM support, SMP maintenance, and MVS systems programming.

- In recognition of the "mixed shop" composition of Amdahl large system user sites, Amdahl is very flexible in service delivery, which occasionally requires Amdahl field engineers to perform problem isolation and diagnosis on non-Amdahl equipment. While it would be economically unfeasible for Amdahl to provide extensive third-party maintenance support to users on "foreign" peripherals (since Amdahl contractually provides 24x7 coverage on Amdahl processors, peripherals, and communications devices), the company's philosophy that a "systems problem is an Amdahl problem" closely approaches the site management principle. In limited situations, Amdahl has provided support on non-Amdahl equipment on an ad hoc basis.

SERVICE DIRECTIONS

- Amdahl is entering a critical period in the areas of product introductions and service. Facing increased competition, both from traditional competitors such as IBM and NAS and from smaller but increasingly powerful super-minicomputer manufacturers from below, the parallel processing market is becoming increasingly price and performance competitive.

- Furthermore, this price sensitivity is becoming felt in the area of service, where users are recognizing the competitiveness of pricing from both manufacturers and third-party maintenance. Amdahl has positioned itself as a premium service provider through its around-the-clock coverage and its "any service problem is an Amdahl problem" philosophy. While Amdahl continues to meet (and in many areas exceed) its users' service requirements, increased user pressure to reduce service prices should encourage Amdahl to consider rethinking its service pricing structure to the degree of introducing lower-priced, lower-coverage service alternatives.

SERVICE VENDOR PROFILE

BURROUGHS CORPORATION
Burroughs Place
Detroit, MI 48232

CEO: W. Michael Blumenthal
Vice President, Field Engineering:
Conrad Strelau
Revenues, Fiscal Year 1985:
$5 Billion

BACKGROUND

- In May 1986, Burroughs and Sperry finalized a merger that began almost a year earlier, culminating the $4.8 billion, $76.50 per share takeover of Sperry Corporation by Burroughs. At first, Sperry's chairman, Gerald G. Probst, resisted Burroughs' attempts at acquisition; however, Burroughs doggedly pursued the purchase, hoping to result in a company with the combined resources to rank number two in the computer industry (behind IBM and in front of Digital Equipment Corporation) and to better compete with IBM (although the combined company still posts sales that are one-fifth those of IBM). Incidentally, the investment bankers of Sperry and Burroughs who brought together the deal stood to make $37 million from the merger.

- While the merger does create a large competitor for IBM with a combined revenue base of $10.7 billion and over 138,000 employees, there are those who question the "closeness of fit" between the two manufacturers. While both companies' strengths lie in their mainframe computer products, Sperry's strong suit is in the government industry segment while Burroughs has a greater presence in commercial markets. Furthermore, there is no existing compatibility between the previously competing computer systems, suggesting to some that this merger may follow the same path as the failed Sperry-RCA and Honeywell-GE mergers.

- In addition, the new company will need to meld two opposing corporate cultures successfully, with Burroughs being much more businesslike compared to the more relaxed Sperry environment. More than a few feathers were ruffled during the takeover attempts, creating a need to alleviate problems in areas such as managerial and worker concerns over job security and corporate direction, especially in light of the obvious need to eliminate redundant activities in such areas as marketing, research and development, and administration.

- Burroughs undoubtedly saw the acquisition as a way of breaking out of a four-year slump in sales, plagued by an aging product line that saw only moderate success in the introduction of the "A" series of mid-range and high-end mainframe systems. This new line was designed to allow easy migration from older installed products; indeed, user intentions to take this route provide a reason for optimism. However, 1985 orders increased only 8% over the previous year's, suggesting that the impact of the new series will be more apparent in 1987.

- Burroughs continued to do well in the workstation area, with its B25 series of microcomputers and its newly introduced, 80126-based B27. Where Burroughs sells its large systems through direct sales forces, the company has also been successful selling workstation products through vertical market reseller channels.

- When Blumenthal arrived at Burroughs in 1979, user satisfaction with service and support at Burroughs was at an all-time low. Blumenthal announced a well-publicized redirection in service, "service and support second to none," demonstrating a company perception of problems in this area and a concern with showing improvements. Primary problems in logistics control and distribution were targeted and, as a result, Burroughs instituted a new real time spares tracking system, among other logistical changes. INPUT studies have demonstrated that user satisfaction in this area has improved.

SERVICE DEMOGRAPHICS

- While any discussion of the "combined" Burroughs-Sperry organization is extremely premature, it is almost a certainty that massive reorganization changes will result in a streamlined service and support operation. While Burroughs spokespeople assure users of both Burroughs and, more specifically, Sperry equipment that the new company is completely committed to supporting the mainframe architectures of both companies, joint subcommittees with representatives from both companies are debating necessary changes for 1987.

- Currently, Burroughs offers service out of 835 locations in the U.S., including eight regional support and dispatch (RESPOND) centers and 17 spare parts depots. In addition, Burroughs subsidiaries--Memorex and SDC--offer service and support to their own respective customers through separate service organizations.

- Burroughs employs an estimated 4,000 engineers who handle hardware problems. An additional 1,200 people, employed in its separate Software Products and Services Division, handle applications software support, educational services, and professional services.

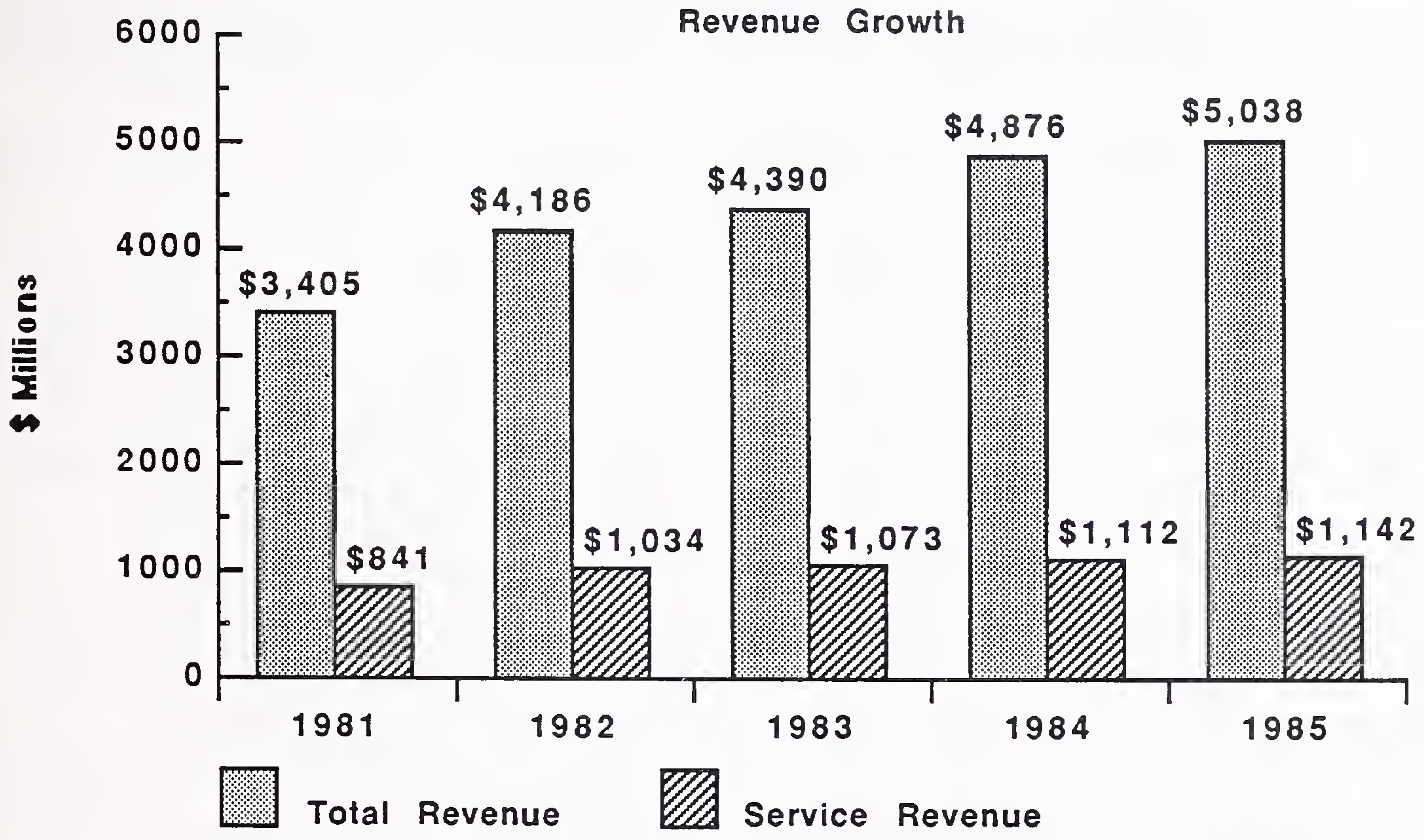
- Exhibit IV-B-1 presents Burroughs' overall sales and service revenue growth for the past five years.

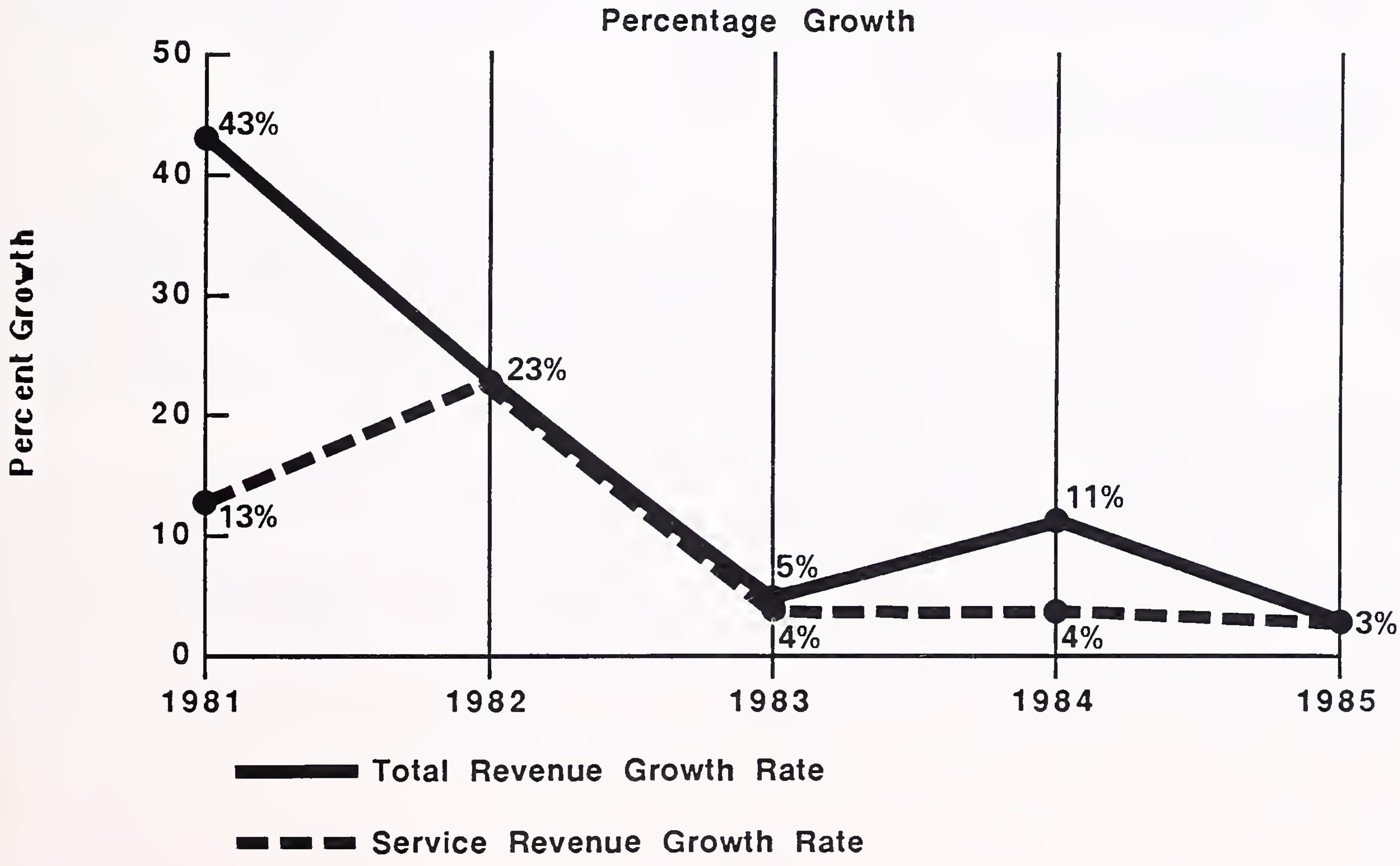
SERVICE DELIVERY

- Burroughs offers a wide range of hardware maintenance and software support service contracts, depending on the size and type of equipment covered. Generally, basic hardware maintenance coverage is for eight consecutive hours, Monday through Friday (excluding holidays). Users can upgrade their coverage to extended hours/days, up to a seven-day, 24-hour coverage.

EXHIBIT IV-B-1

BURROUGHS CORPORATION'S REVENUE AND PERCENTAGE GROWTH





- Burroughs' newer products, such as the A-series of mainframes, include remote support capabilities in the form of a Maintenance Subsystem, which allows access to and displays of the status of the CPU, I/O, and Data Communications subsystems. The diagnostic software is system-driven and runs on-line, allowing normal PM routines to be run while applications programs are processing.

- All software and software support is unbundled, and users can choose from five different software Product Support Agreements (PSAs):

  - PSA 1 - telephone support for mainframe customers.

  - PSA 2 - extended support for mainframe customers who require on-site support.

  - PSA 3 - centralized telephone support for selected minicomputer software products.

  - PSA 4 - telephone software support for micros.

  - PSA 5 - basic support (by telephone) for certain products not normally available to users.

- Burroughs offers a wide range of educational courses that cover such broad areas as systems management and operations, control systems, network systems, data base systems, and programming. Courses range anywhere between one and ten days in length and are offered both at the user's site or at one of five Burroughs Customer Education Centers. Burroughs also offers many professional services such as site planning, capacity planning, programming, and consulting services.

SERVICE DIRECTIONS

- It is difficult to speculate on future directions at Burroughs while discussions are still underway regarding how the two companies, Burroughs and Sperry, will combine. Currently, the two companies are acting almost completely independently; however, cost cutting and efficiency efforts will undoubtedly require layoffs and restructuring within the combined company. Furthermore, officials of both companies consistently refer to a "combined" company with a "yet-to-be-determined" new name.

- Hopefully, the merger will prove to be more successful than earlier attempts to combine computer companies, most notably the Sperry-RCA and Honeywell-GE mergers. Both users and employees of Sperry have expressed concern over their place in the new company, even though officials of both companies have publicly attempted to allay these fears. Management faces a difficult task in melding the two disparate corporate cultures.

SERVICE VENDOR PROFILE

CONTROL DATA CORPORATION
8100 34th Avenue South
Minneapolis, MN 55420

CEO: Robert M. Price
Vice President, Engineering Services:
W. Fitzgerald
Revenues, Fiscal Year 1985:
$3.7 Billion

BACKGROUND

- Control Data Corporation (CDC), founded in 1957, is a leading supplier of computer systems and services to the scientific and engineering marketplaces. In addition, CDC provides a number of computer-based services (e.g., the Arbitron Ratings Service) to the financial and commercial markets. In 1985, CDC underwent a significant corporate and financial restructuring in response to losses that reflected problems within a number of the company's business areas and investments. Most visible of these changes was the sale of its Ticketron operations to an affiliate of Allen and Company Incorporated in May 1986 for $140 million. The resulting year end (December 31) corporate revenue for 1985 was $3.7 billion, which represented a loss of $13 million from the restated 1984 corporate revenues.

- CDC computer activities are broken down into the following groups:

    - Scientific/Engineering Systems and Service, which includes computer systems (ETA Systems Inc., which produces and sells advanced supercomputers with parallel processing capabilities), government systems, scientific and engineering services (which is split between CIM and Scientific Information Services), and technical support services (providing computer maintenance as well as consulting and training services).

    - Data Storage Products, which designs, develops, manufactures, and sells magnetic disk, magnetic tape, and optical disk drives and related components directly to OEMs.

    - Financial Information and Commercial Services, which incorporates a wide range of computer-based services, including media popularity measurement services and commercial (and financial) accounting services.

    - Other Computer Services, which includes computer-based services in the job creation, training and education, and health care service areas.

- Of primary interest is the Scientific/Engineering Systems and Service group, which includes all computer activities and maintenance service areas. CDC's basic computer line is the Cyber 180 series, first introduced in 1984. This wide range of mainframe computers (prices range from $120,000 to $6.5 million) compete primarily with IBM in the upper range and Digital Equipment Corporation on the lower end. While this marketplace is extremely competitive, the Computer Systems group has managed to be profitable in each of the last five years until 1986. CDC sees itself as a leading supplier to the petroleum (seismic processing) industry, domestic electric utilities industry, and the weather forecasting industry.

- CDC also sold off other parts of its computer activities, particularly those in its Data Storage Products area. In December 1985, CDC sold its computer tape and floppy disk business to Xidex. In January 1986, CDC sold its IBM PC-compatible disk drive unit to Combex. In May 1986, CDC sold its 26% interest in Centronics Data Computer for $25 million to a group of Canadian investors led by two Drexel Burnham Lambert managing directors. And in June 1986, CDC unloaded the assets of its discontinued floppy disk drive business to Shugart, transferred its tape drive business to a joint venture with Philips, and closed a fifth disk drive facility, reducing total employment in that area by almost 6,000.

SERVICE DEMOGRAPHICS

- CDC derived 30% of its total revenues in 1985, or $494 million, from its Technical Support Services Group. Eighty percent of this total, or $395 million, was derived from computer maintenance services. Maintenance activities also made up almost all of this group's profits in 1985.

- CDC employs 4,700 people worldwide in service, approximately 2,000 of these as customer engineers dispatched to both CDC and third-party customers in the U.S.

- Computer maintenance activities are performed out of the Engineering Services Division, which is made up of the following departments:

  - Personnel.

  - Administration (financial planning and controls, accounting, MIS).

  - Marketing and sales.

  - Logistics (including repair/refurbishment services).

  - International operations.

  - Support operations (maintenance and service planning, central hardware and software support, system product planning and management, contracts, pricing, operations support).

  - Regional operations managers.

- Exhibit IV-C-1 presents CDC corporate and service revenue growth for the last five years. These figures have been adjusted to reflect the corporate and financial organizational changes previously discussed.

SERVICE DELIVERY

- Hardware maintenance is delivered to CDC customers via one of three methods: contractual maintenance services, noncontractual (per call) services, or special maintenance services policies (e.g., special equipment, "as-is" equipment, OEM, etc.). The majority of hardware service is performed under contract, which provides CDC service customers with on-call response for remedial maintenance and scheduled preventive maintenance activities to be performed during specified nine consecutive hour principal periods of coverage. Customers can expect two-hour response times (excluding travel time). Customers can also contract for extended hours of coverage, provided they are within a 50-mile radius of a Full Service Center.

- Software support is unbundled from hardware maintenance and is offered in four levels:

    - Class I - standard service agreement, including updates, enhancements, and access to the central support center.

    - Class II - similar to Class I, but with reduced obligation to CDC, especially with regard to successor products.

    - Class III - limited coverage that does not include enhancements.

    - Class IV - no support.

- CDC provides access to a software problems data base called "SOLVER," which even downloads fixes if a similar problem can be found. SOLVER is available to contract customers through a toll-free 800 number. CDC supplements this offering with direct telephone support, available 7 days a week, 12 hours per day.

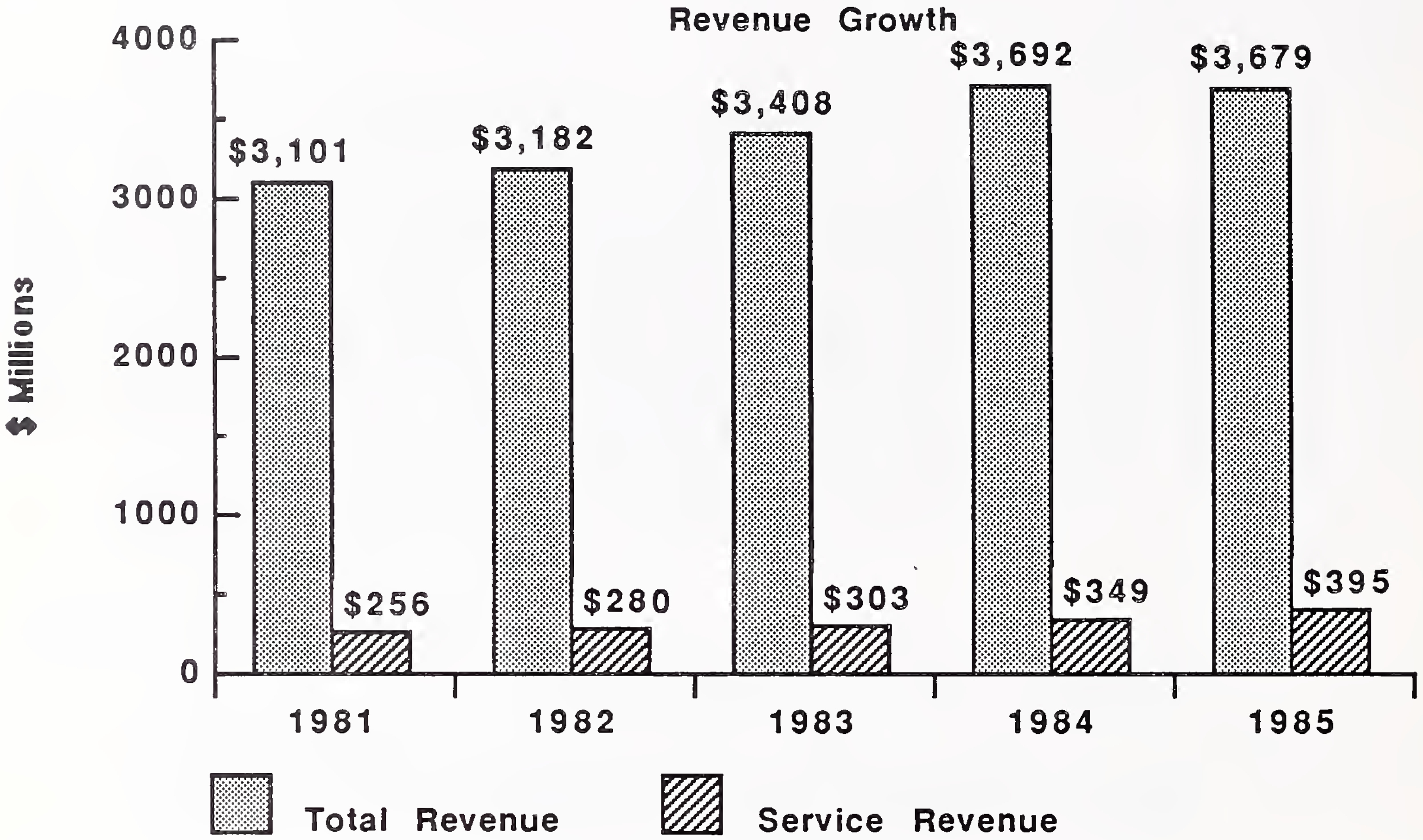
- CDC provides a wide range of professional services to software users, including scheduled troubleshooting activities, capacity planning/performance analysis, system optimization, and system software installation, consulting, and support.

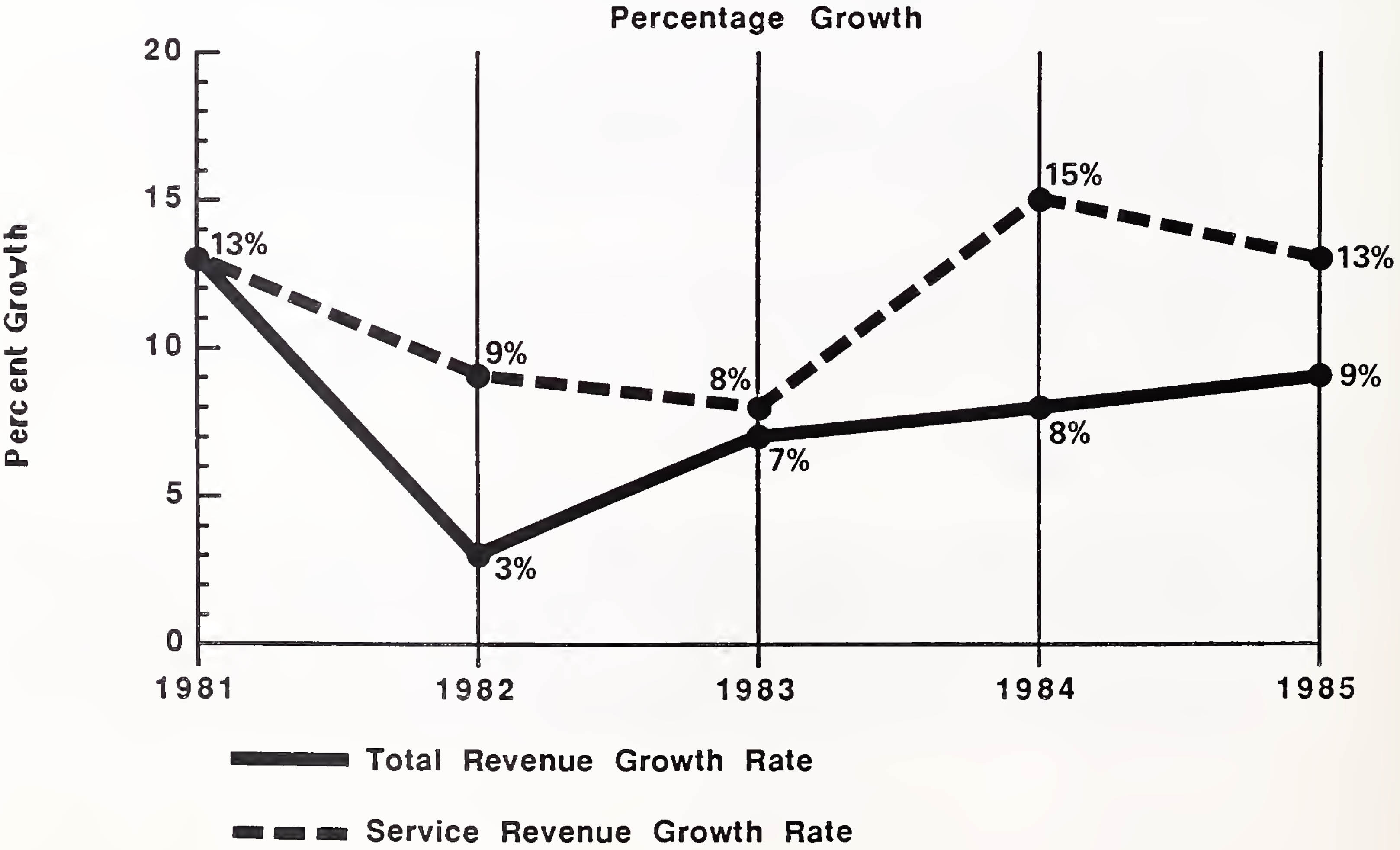
SERVICE DIRECTIONS

- Overall, CDC made a major move toward slimming down and focusing its computer products and services activities. For example, CDC reduced its number of disk drive products from 14 to 6, concentrating on the high-performance, high-capacity end and dropping low-cost, low-margin floppy disk drive activities. Still, even with these cuts, CDC faces a difficult task of retrieving lost market share in an increasingly competitive marketplace.

EXHIBIT IV-C-1

CONTROL DATA CORPORATION'S REVENUE AND PERCENTAGE GROWTH





- One area where CDC has prospered is in maintenance and support, where CDC has realized both revenue and profit growth even through the economic difficulties of the past few years. Even though reduced sales and improved hardware reliability would, at first consideration, seem likely to reduce potential maintenance revenues, CDC service activities should continue to grow and prosper due to the company's flexibility and inventive approach to service.

- One definite area of continued growth for CDC will be its third-party maintenance activities, which are also the responsibility of the Engineering Services Division. CDC's third-party organization offers size, experience, and flexible service offerings, such as third-party applications software support (as one of the few TPM companies who offer software maintenance services).

- CDC's flexibility is also demonstrated in its "unbundled" service offerings, which allow users to pick and choose the level of service needed at their particular site.

SERVICE VENDOR PROFILE

FLOATING POINT SYSTEMS, INC.
3601 S.W. Murray Boulevard
Beaverton, OR 97005

CEO: Lloyd Turner
Vice President, Customer Services:
Robert MacDonald
Revenues, Fiscal Year 1985:
$127 Million

BACKGROUND

- Floating Point designs, manufactures, sells, and services a series of specialized computers aimed at scientific and technical markets which require computing speeds and capabilities over and above the requirements of the general purpose minicomputer and mainframe markets. The computers sold by Floating Point are aimed at the market lying between fully configured superminis/mainframes and high-performance supercomputers such as the Cray and CDC Cyber 505. Typically, a Floating Point system is attached to a general purpose system (e.g., IBM, DEC, or Apollo) to perform specialized computing applications.

- 1985 proved to be a difficult year for almost all computer companies, and Floating Point was no exception. While revenues increased 7%, this growth was well below the revenue growth goals of 20-30% laid down by corporate management. Primary blame was placed on reduced shipments to a significant OEM customer who experienced a severe decline in its industry (the medical imaging market). Other factors included increased competition, lengthened purchase decision cycles, and a sluggish economy.

- Floating Point released a new scientific computer, the FPS-264, in July 1985, which quickly became popular in the aerospace and defense-related industries. Later in 1985, Floating Point began shipments of an enhanced replacement of its FPS-164, called the FPS-364. This system, with a starting price under $300,000, offers improved price/performance characteristics for entry level scientific computer users.

- During fiscal 1985, Floating Point increased its number of sales/service locations to 25 in the U.S., representing an addition of 30%.

- Most recently, sales took a dramatic turn for the worst as Floating Point suffered its first quarterly loss (third quarter ending July 31) of $3.8 million, representing a 37.5% loss. The company blamed an "underestimation of the negative effects of the worsening capital spending environment and increased competition." As a result, Floating Point announced a 200 person layoff, a wage freeze, and a hiring freeze.

SERVICE DEMOGRAPHICS

- Exhibit IV-D-1 shows that Floating Point Systems derived $13.8 million in service revenues, up 59% over 1984.

- Floating Point offers service out of 25 locations nationwide; in addition, it currently has three parts depots. Floating Point employs approximately 300 people, an estimated two-thirds of which are engineers.

SERVICE DELIVERY

- Hardware maintenance is provided to contract customers Monday through Friday, 8 a.m. to 5 p.m. All replacement parts are provided on an exchange basis. Users of the FPS-164 and FPS-264 systems receive remote diagnostics. Contract customers also receive a discount on FPService software support.

- All systems customers receive pre-installation site planning, installation of both hardware and FPS-ordered software, documentation, warranty (90 days from installation or 120 days from shipment, whichever comes first), and 90 days of free FPService software support.

- Floating Point users can opt for software support on a contract basis through FPService, which provides updates, toll-free hotline, manual updates, electronic access to the Technical Action Requests (TARs) data base, and remote software maintenance (available to FPS-164 and FPS-264 users only). In addition, FPService customers receive a technical journal called CHECKPOINT, which provides TAR listings, schedules of updates, training schedules, programming tips, and feature articles of interest. FPService contracts also list formal problem resolution goals, ranging from two weeks for problems causing complete work stoppage to seven weeks for enhancements.

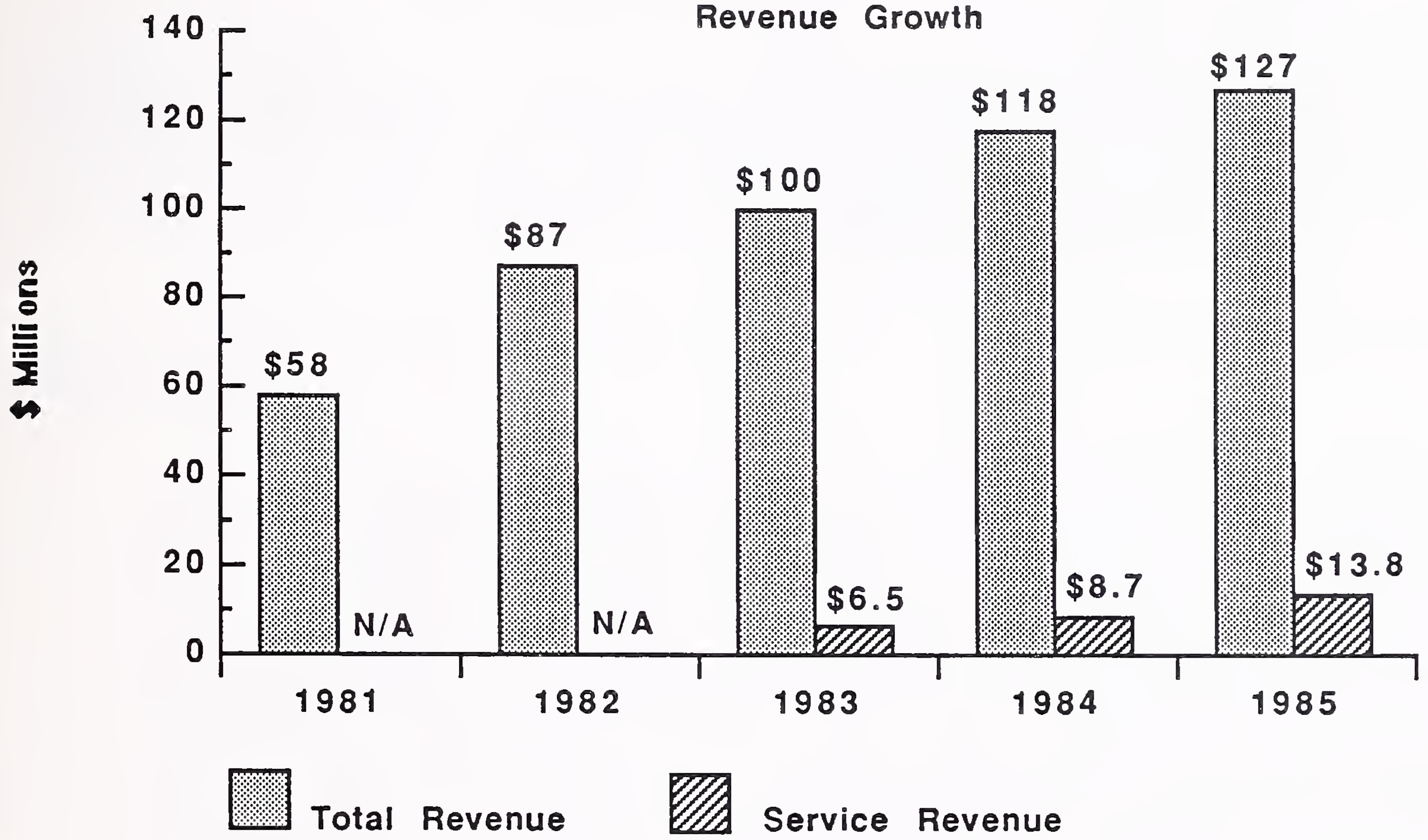
- Floating Point also provides a wide range of educational services to its customers, in both software and hardware training. Users can opt for classroom training at Floating Point's Beaverton (OR) headquarters or choose host-based education at the user's site. Floating Point publishes a catalog of currently available training courses.

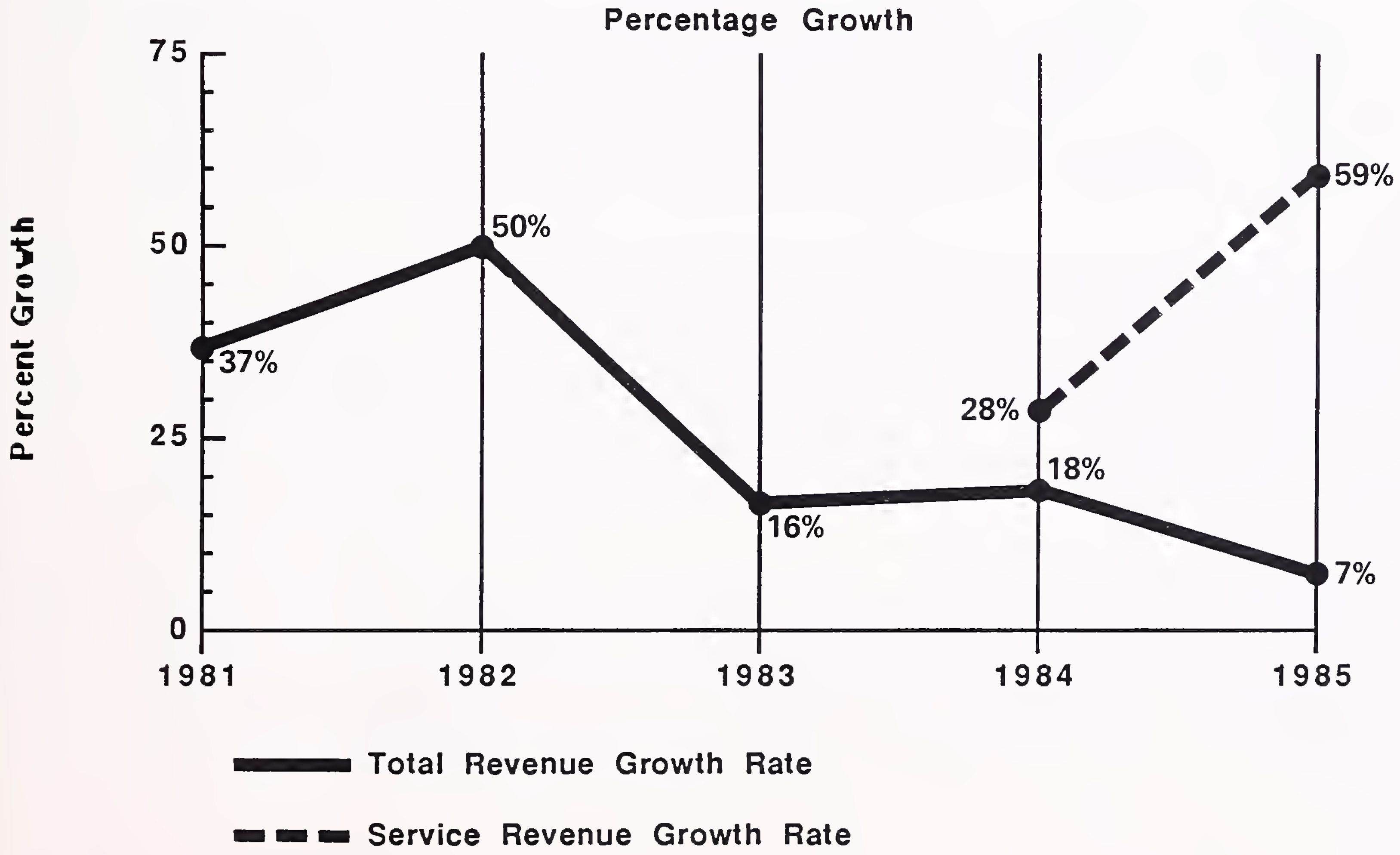
SERVICE DIRECTIONS

- Floating Point Systems has publicly stated four goals for its service organization--quality service, customer satisfaction, employee satisfaction, and financial contribution. Floating Point attempts to track the success of the first two goals through internal surveys conducted by mail. FPS strives to maintain employee satisfaction by emphasizing their importance in the company's success. And while revenue growth and profitability in service are not primary objectives, FPS has found that by improving quality of service through increased service offerings, service costs have been reduced dramatically to the point that its service organization is now profitable (and has been for the last four years).

EXHIBIT IV-D-1

FLOATING POINT'S REVENUE AND PERCENTAGE GROWTH





- Floating Point does not demonstrate much interest in third-party maintenance, preferring to concentrate on supporting its own installed base. Third-party maintenance does not seem a likely growth area for FPS, considering its relative size.

- Given the increased use of remote diagnostics within FPS' product base, the skill mix required by FPS field engineers is rapidly changing. FPS is actively recruiting entry level engineers with "people skills" who can be trained to provide "systems level" support (both hardware and systems software) and be able to better interact with customers.

SERVICE VENDOR PROFILE

HONEYWELL INC.
Honeywell Plaza
Minneapolis, MN 55403

Executive Vice President, Information Systems: W. N. Wray
Vice President and Group Executive, U.S. Marketing and Services Group: J. J. Verant
Revenues, Fiscal Year 1985: $1.95 Billion

BACKGROUND

- Honeywell Inc., first incorporated in 1927, develops, manufactures, markets, and supports automation and control equipment for a wide range of government and commercial applications. Honeywell's activities can be categorized into three main industry segments--aerospace and defense, control products and systems, and information systems. Products developed in the area of information systems range from microcomputers that sell for less than $2,000 to large-scale mainframe systems that are priced in excess of $7 million. In addition, Honeywell provides a wide range of services to customers of such products, such as systems maintenance, programming aids, software products, educational services, and professional services, and Honeywell is also engaged in third-party maintenance for users of non-Honeywell equipment.

- While 1985 proved to be a difficult year for most computer companies, Honeywell was able to move forward into a number of new areas such as factory automation. Honeywell also provided a growth route to present users of large systems with the introduction of its DPS 90 mainframe system, based on NEC 36-bit-based ACOS 100. In addition, Honeywell is marketing a fuly redundant DPS 90/92T system to compete in the fast growing fault tolerant marketplace.

- The positive news in the larger systems end of Honeywell's product line was offset by slow sales in its small systems (DOS 6) product area, so slow, in fact, that Honeywell chose to reorganize its small computer and office systems operations within Information Systems and lay off 600 employees (17% of that unit's workforce). The move followed a layoff of 120 workers in that unit earlier in the year. More recently, the company announced plans to lay off 4,000 people corporate-wide, bringing the number of people Honeywell has trimmed to 9,000 since 1980.

- While the major product releases were in the maintenance end of its business, Honeywell's past strength and reputation is centered around its departmental minicomputers and office systems as Honeywell is recognized as a leader in the office automation movement. The slowdown in Honeywell's small systems sales have reduced the total contribution of information systems revenues, down from 34% of total corporate revenues in 1981 to only 29% in 1985 (see Exhibit IV-E-1).

SERVICE DEMOGRAPHICS

- Honeywell employs between 3,000 and 3,500 people in field service, approximately 2,000 of which are actual field engineers. The company dispatches service out of 250 service locations nationwide for both its own equipment users and third-party maintenance customers. In addition, Honeywell has three regional parts depots and 80 regional carry-in/mail-in service depots.

- INPUT estimates that Honeywell's Customer Service Division brought in $750 million in service revenues, up 8% from 1984. Approximately $10 million of this is estimated to be third-party maintenance revenues derived by Total Care TPM activities.

SERVICE DELIVERY

- Service and support varies at Honeywell, depending on the product type. For example, mainframe (DPS 8, DPS 88, and DPS 90) users receive the following hardware support:

  - Basic Hardware Maintenance, which includes access to the Technical Assistance Center (TAC), access to remote diagnostics, on-site support with two-hour response, and a principal period of maintenance coverage between 8 a.m. and 6 p.m., Monday through Friday. Honeywell does not charge for extended coverage (until 8 p.m.) for any work begun during the principal coverage.

  - Honeywell offers a wide range of extended coverages, up to and including 24-hour, 7-day coverage at a 40% premium.

  - Under Basic Hardware Support, users also receive many services such as site preparation, installation, and field change orders (FCO) at no additional charge.

- Large system customers who contract for hardware maintenance also receive software support at no additional charge. This support includes toll-free, 24-hour access to the National Response Center, TAC support from software specialists, access to the STARLOG on-line problems data base, software patches and updates transmitted via synchronous communications lines or on magnetic tape, and on-site support when deemed necessary.

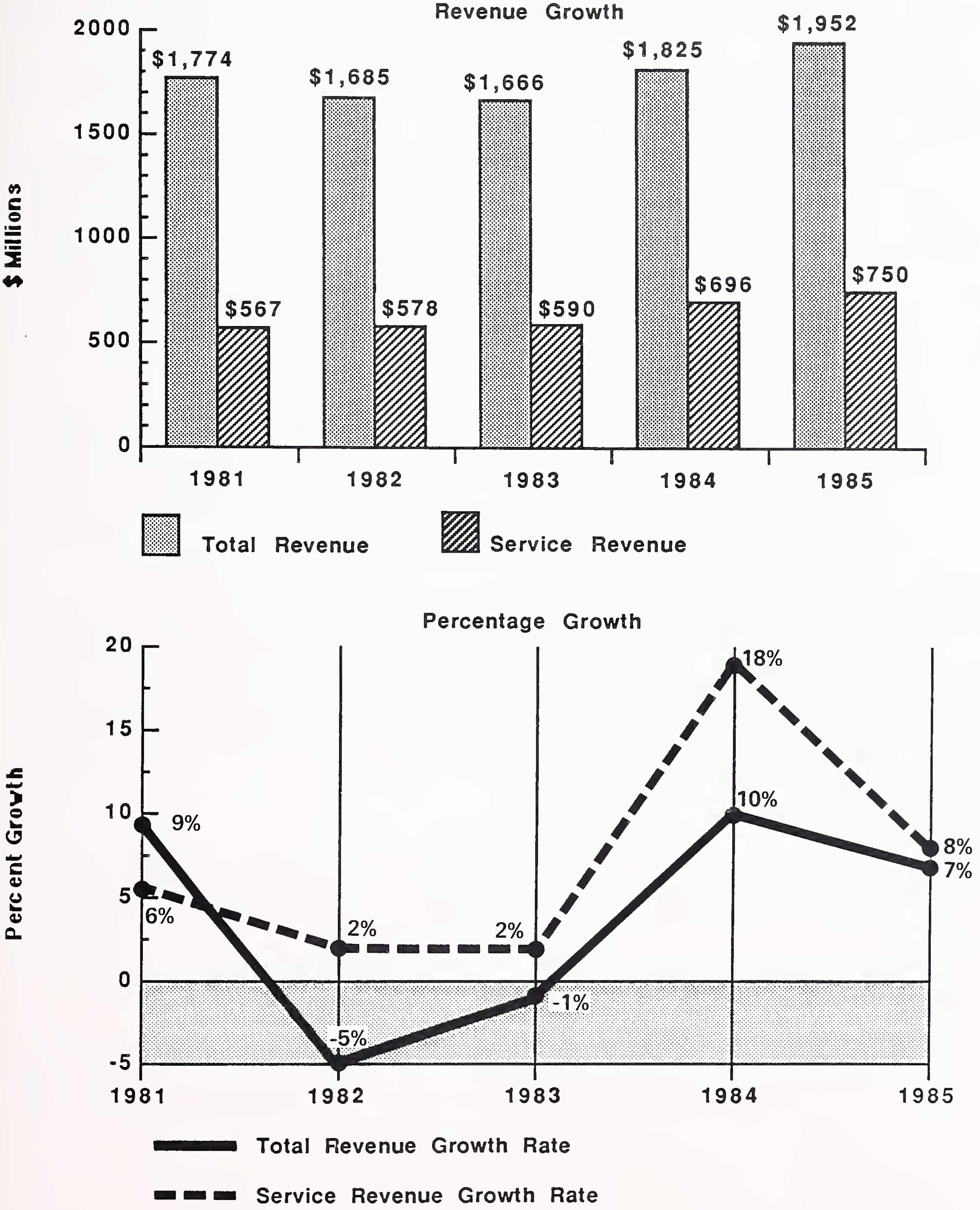
- Large systems users can also receive expanded systems software support (GCOS), including:

  - On-line remote tools for expanded problem-solving capabilities.

  - Access to on-line Incident Reporting System (problems data base).

EXHIBIT IV-E-1

HONEYWELL INC.'S REVENUE AND PERCENTAGE GROWTH



  - Development of corrective actions.

  - Continued involvement in measuring the effectiveness of patches and workarounds.

- Small systems users receive similar support offerings, with the following exceptions:

  - Four-hour response (within 100 miles; outside 100 miles normal travel time is added).

  - For selected DPS 6 products (e.g., printers, terminals), Honeywell offers a self-maintenance option called Customer-Assisted Maintenance Program (CAMP), which provides customer replaceable units (CRU) dispatch and mail-in. The customer notifies Honeywell when a replacement CRU is needed, and within 24-48 hours (depending on delivery mileage) or 4-8 hours (if expedited dispatch is contracted) a replacement is delivered. In addition, a lower priced option, CRU mail-in, guarantees five-day shipment of the needed replacement after the faulty part is received by Honeywell.

- Small systems users who are primary licensed GCOS customers receive Basic Software Support including telephone access to the National Response Center (24 hours a day, 7 days a week), telephone access to the TAC Center (8 a.m. to 6 p.m., Monday through Friday), access to a problems data base, system revisions, updates, and technical documentation. Users can also upgrade to on-site software support, initial software installation, and a systems software upgrade service that provides periodic delivery of software patches.

- Honeywell offers educational services in the form of its Education Account Management Service, which places an education consultant at the user site to set up a customized training program fitted to the customer's needs. Honeywell offers over 200 specialized courses in operations, programming, transaction processing data base management, and network development, using a wide range of educational techniques including computer-aided instruction (CAI), multimedia systems, and on-site classes.

SERVICE DIRECTIONS

- Honeywell has experienced difficult times in both the minicomputer market and the office systems market, both considered foundations of the company's product line. A reflection of these difficult times is the significant reorganization and reduction of computer-related operations at Honeywell. Indeed, computer systems, which at one time represented over 50% of Honeywell's business activities, now represents less than 30%.

- Honeywell has attempted to strengthen its position by moving away from more general purpose applications to become perceived as a systems integration specialist. This effort should help improve sales; however, Honeywell will need to address certain unmet service needs uncovered in the 1986 user service requirements studies, primarily in the software support areas in both systems and applications. User requirements for software support in systems integration applications will increase at a much faster rate than for other, more general purpose systems.

- Honeywell's move toward systems integration has required that it go against an industry-wide trend of "unbundling" service delivery, particularly in the areas of professional and educational services. Instead, it may prove to be strategically correct for Honeywell to emphasize the "completeness" of its service offering to system integration customers, who most likely will be attracted to a full service provider and are likely to be less price-sensitive.

- Honeywell will also hope to expand its third-party maintenance activities, particularly in light of its systems integrator role. Even the Apple-Honeywell agreement (to date the largest Honeywell TPM agreement) appears more optimistic due to the Macintosh's success in desktop publishing.

SERVICE VENDOR PROFILE

INTERNATIONAL BUSINESS MACHINES Armonk, NY 10504	President and CEO: John F. Akers President, National Service Division: Charles P. Biggar Revenues, Fiscal Year 1985: $50.1 Billion

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BACKGROUND

- IBM is involved in the field of information handling systems, equipment, and services designed to meet the information processing needs of a wide variety of commercial and government industries and applications. IBM is a leading manufacturer in virtually all data processing and telecommunications equipment sectors. Overall, IBM gross revenues rose 20% to $50.1 billion in 1985, even in a difficult year for the computer industry.

- 1985 proved to be a year of product introductions and product family extensions. Foremost of IBM's new products is the top-of-the-line 3090 mainframe (also called Sierra); other products introduced included PC versions of the System 36, a Token-Ring Network, and a double-capacity 3380 disk drive.

- However, IBM was not left untouched by the industry slowdown of 1985. User reaction to the 3090 series has been mixed, with some users opting for the older 308X and 303X mainframes and adding disk and tape drives. IBM's 4300 mid-sized computer systems came under heavy attack by popular new product introductions by Digital (the VAX 8800) and Data General (MV 20000). Foreign competition from Japan, Taiwan, and Korea has severely impacted IBM's position in the low-end microcomputer product area with the introduction of extremely low priced and comparable (and in some cases, higher) performance "clones."

- While IBM was correct in blaming 1986 performance on problems in the overall U.S. economy (e.g., currency fluctuations, slowed capital spending by large computer users), IBM's disappointing performance (sales growth shrank from 28% in 1984 to 16% in 1985, sales gross profit growth fell from 29% to 12%, and overall gross profits slipped from 14% to 7%), a small part of the problem can be attributed to a growing lack of focus and compatibility within IBM's product lines. In its desire to address and satisfy the various processing needs of a wide range of potential computer users, IBM has designed more than 15 different computer architectures since 1970, none of which could use the same software. This created an ever-increasing demand for compatibility and communications capabilities within its user base, which, left for the most part unsatisfied, opened the door for others, principally Digital Equipment Corporation, who had emphasized communications capabilities within its broad product lines.

- IBM wants to narrow its product line and emphasize three architectures--the 370 mainframe design used by the 43XX, 303X, 308X, and 309X lines, the System/36 minicomputer line, and the PC family which includes the PC-XT, PC-AT, and PC Convertible. IBM is also focusing on increasing the compatibility within and then between these three areas. IBM has already made a number of improvements, including:

  - Increasing the power and communications capabilities within its PC family.

  - Increasing the power of its System/36 products which will improve its departmental processing capabilities. IBM will also work on software that will allow the transfer of data between 370 computers and the System/36.

  - Extending the 370 architecture down through the product liens to an eventual desktop system.

- During 1985, service revenue (comprised of maintenance, program products, federal systems maintenance, and other maintenance service) growth slipped from 25% in 1984 to 20% in 1985. However, improved efficiencies, particularly in logistics and diagnostics capabilities, increased services' gross profit growth from 26% to 30%. Growth in the maintenance-alone service segment increased from 15% (1983-1984) to 16% (1984-1985).

- Also during 1985, IBM realized the benefits of an advanced digital communications network, called Digital Communications Systems, that links IBM field service personnel equipped with hand-held data terminals to computers located at regionalized sevice data centers. These terminals improve dispatching efficiency along with providing a more efficient way of communicating, ordering parts, and receiving technical data about a user's site. In fact, IBM has been approached by at least 60 companies interested in access into the system.

- 1985 also marked the year in which IBM first offered service on products that it did not manufacture. Early in May 1985, IBM announced that it would provide limited maintenance service on a selected list of non-IBM products that one would typically find attached to IBM Personal Computers. In June, IBM increased the list of products covered in addition to expanding the type of coverage available. These announcements were a marked departure from the past IBM philosophy of providing IBM service and support (a premium that is perceived as a sales inducement) on IBM equipment alone. Instead, IBM's new position reflects the likelihood of non-IBM components at an IBM personal computer user's site, spurred by increased user demand for IBM support.

- A last noteworthy item from 1985 concerning IBM service was the much-discussed but little understood Enterprise Maintenance Agreement (EMA), which was offered on a test basis by IBM. EMA was designed to offer large installation users up to a 14% discount if the agreement includes all IBM equipment within the user's company (including off-site equipment) and if the customer tracks down the problem before contacting IBM. Confusion over discount levels and whether all IBM equipment had to be serviced by IBM (instead of third-party maintenance companies) prompted the end of the experiment.

SERVICE DEMOGRAPHICS

- IBM National Service Division, which resulted from the 1984 consolidation of the Field Service and Customer Service Divisions, employs an estimated 30,000 people, two-thirds of which are either hardware or software engineers. The National Service Division is part of IBM's Information Systems Group.

- IBM offers service out of more than 150 branches in the U.S. In addition, IBM offers telephone software support through three regional Support Centers located in Chicago, Tampa, and Boulder (CO). IBM also has over 100 Service/Exchange locations for carry-in depot service.

- In 1985, IBM reported service revenues as follows:

	- Maintenance service	$ 6,103 million	52.9%
16	- Program products*	4,165	36.1
30	- Federal systems maintenance service	618	5.4
27	- Other maintenance service	650	5.6
		$ 11,536 million	100.0%

* Service revenues include both separately billed maintenance and license revenues from applications and systems software program products.

- IBM service profitability was $6.8 billion in 1985, up 30.2% over 1984. Exhibit IV-F-1 presents overall revenue and service revenue growth trends for IBM.

SERVICE DELIVERY

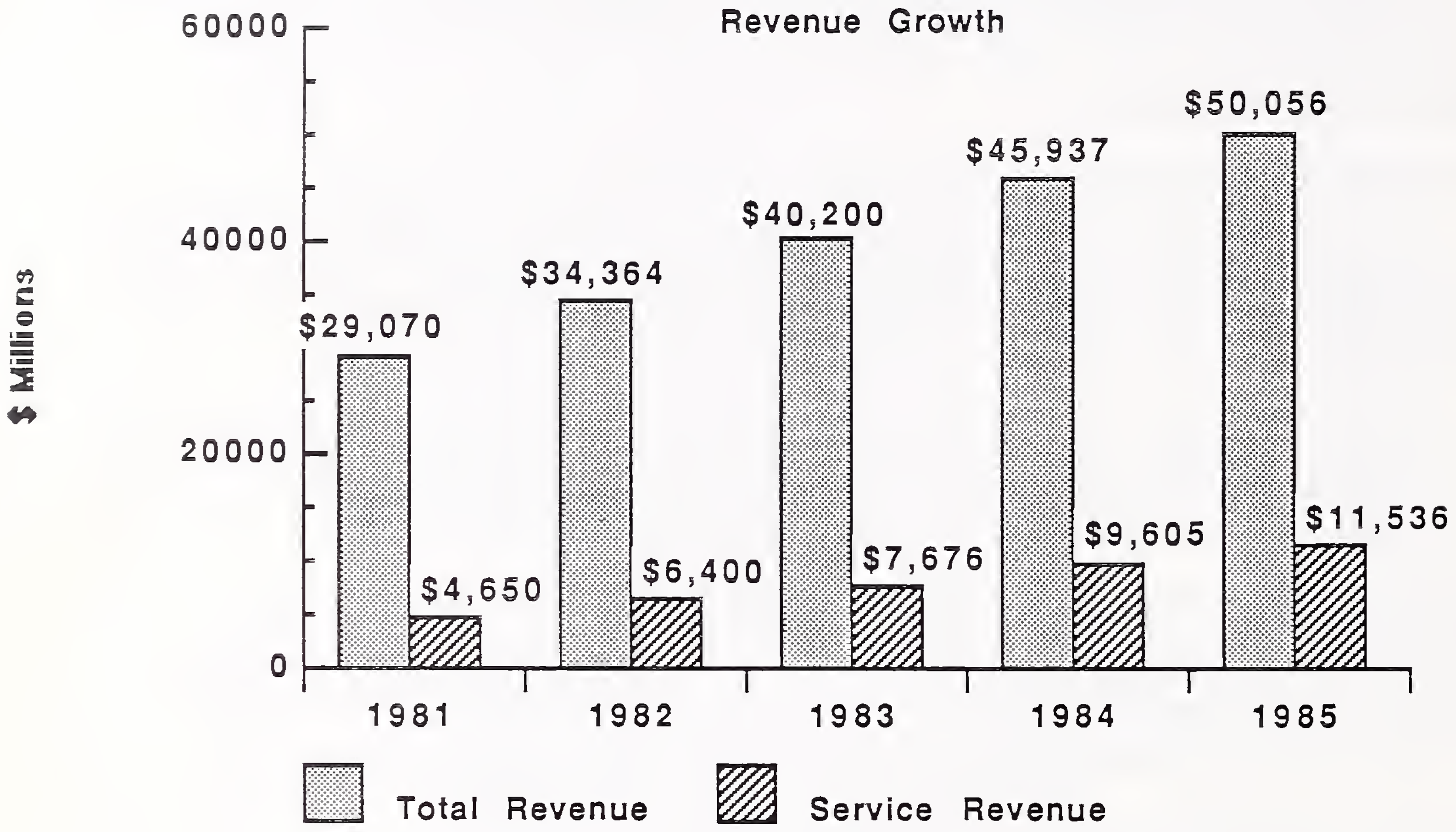
- As might be expected, IBM offers a wide range of service offerings for its customer base. Basic coverage for mainframe and minicomputer coverage includes:

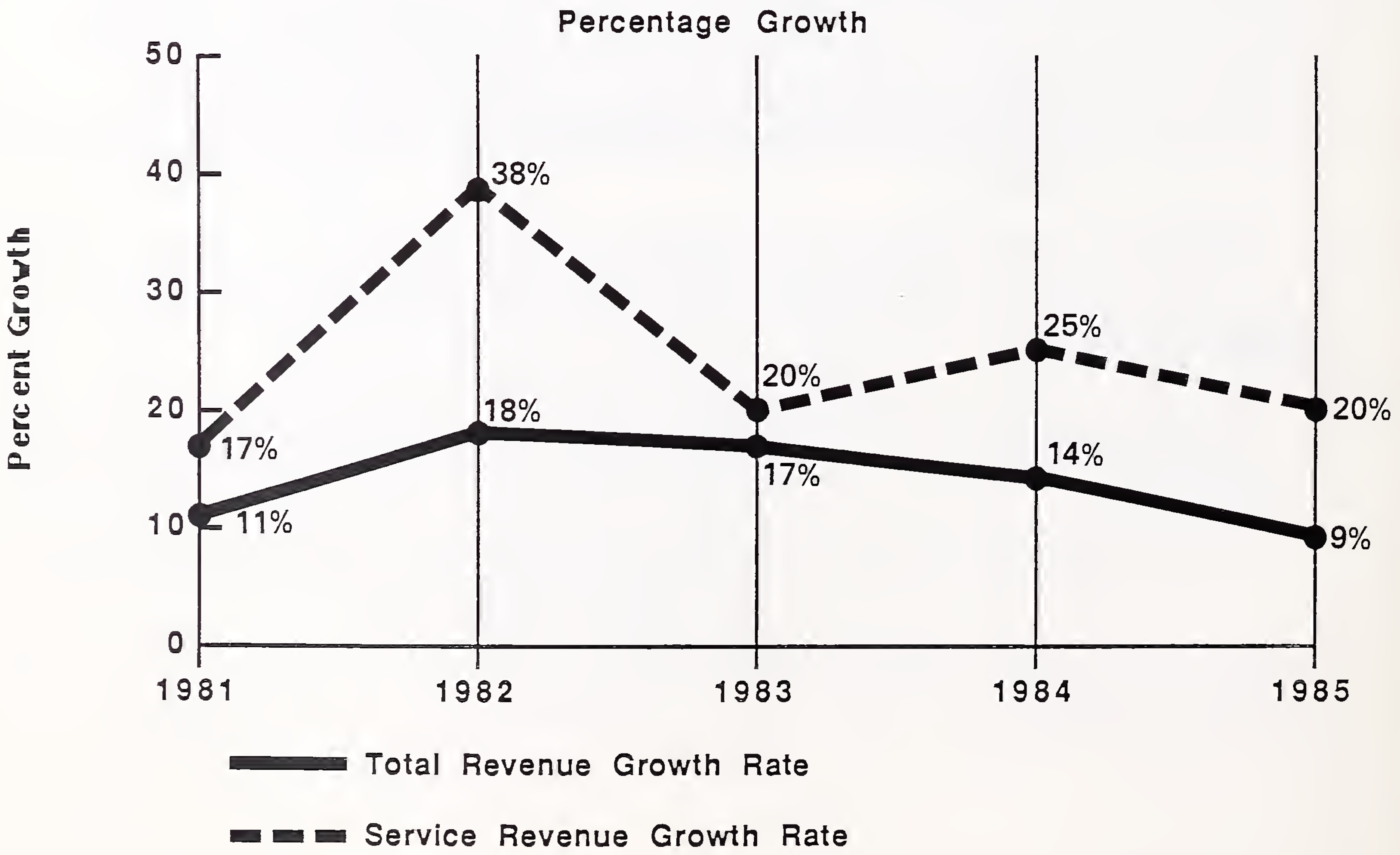
  - Consecutive nine hour coverage, selected by the customer from between 7 a.m. and 6 p.m., Monday through Friday.

  - Scheduled preventive maintenance.

EXHIBIT IV-F-1

IBM'S REVENUE AND PERCENTAGE GROWTH





  - Spare parts, as required, to maintain normal system operating conditions.

  - Access to the IBM support center (described above).

  - Engineering changes deemed mandatory by IBM.

  - Travel to customer site if within 25 miles of an IBM branch office or designated point of service.

- In addition to basic maintenance, users can select a variety of premium services, such as:

  - Extended maintenance coverage for 12-, 16-, 20-, or 24-hours, as well as Saturday, Sunday, and holiday coverages.

  - Premium consulting and planning services.

  - Time and materials coverage (Class 3) for $165 per hour (two hour minimum) during the standard work week and $190 per hour during extended hours.

- Software support is provided predominantly through the three telephone software Support Centers, which provide toll-free, 24-hour, 7-day per week access to one of several hundred IBM software support specialists. IBM states that 84% of all software problems are solved via phone, most of these in less than 30 minutes. IBM mainframe users also have access to this frontline telephone support.

- If the user's software problem cannot be resolved by the Support Center, the customer is put in touch with a Charge Team Support Specialist who will provide specialized phone support. If the problem still continues, IBM will dispatch a program Support Representative to the user's site.

- IBM has successfully "unbundled" educational and professional services, resulting in high user satisfaction and improved efficiency (and profitability) of service delivery. For example, IBM offers a wide range of "Professional Courses," individually priced and specifically designed to cover application areas. In addition, IBM offers System Features Instruction at no charge, and also a wide range of customer executive seminars, industry seminars, and promotional sessions free of charge on an invitational basis.

SERVICE DIRECTIONS

- IBM has publicly stated a service goal built around increasing user satisfaction with the system availability of its equipment through more efficient service delivery. Specifically, IBM's objectives include:

  - Increased reliability and serviceability of its equipment.

  - Increased user capabilities in the service and support of their systems through additional and improved user-run and remote diagnostics.

  - Improved accessibility to IBM service and support personnel.

  - Increased number of service options users may require.

  - Better distribution of parts and service personnel through improved technology.

- Furthermore, it appears that IBM is continuing to become more receptive to user concerns over such service issues as single-source maintenance and increasing service prices in light of the reduced need for hardware maintenance. Specific examples of this include:

  - Introduction of service coverage of non-IBM equipment commonly found on IBM PCs.

  - Testing of various discounting policies, including volume terminal service discounts and the previously discussed Enterprise Maintenance Agreement.

  - Increased emphasis on software support activities.

SERVICE VENDOR PROFILE

NATIONAL ADVANCED SYSTEMS
800 E. Middlefield Road
Mountain View, CA 94042

President, NAS: Daniel Martin
Vice President, Customer Services:
Alfred Macha

BACKGROUND

- National Advanced Systems (NAS) is a subsidiary of National Semiconductor Corporation, a $1.8 billion manufacturer and distributor of electronic components, computers, and POS equipment. NAS is part of the Information Systems group of National Semiconductor, an industry segment comprised of the NAS mainframe and peripheral products operations and the DATACHECKER/DTS point-of-sale (POS) organization. The Digital Systems operation of NAS contributed $637.6 million of National Semiconductor's corporate revenues and $19.1 million in profits, which were a bright spot for a company whose primary business--semiconductors--was shaken by an industry-wide slump that caused reduced capital spending, temporary plant shutdowns, reduced work weeks, hiring freezes, and other cost-cutting measures.

- NAS provided the bulk of the Digital Systems revenue and profit growth in 1985, with an estimated $500 million of that segment's sales. NAS sales were sparked by the release of a family of mainframe and peripheral products known collectively as the Alliance Generation. These products, manufactured by Hitachi, Ltd. of Tokyo, Japan, provide a complete family of high-performance products that compete directly with comparable equipment from Amdahl and, more directly, IBM (and its 3090).

- At the high end of this family is the AS/XL Vector series of mainframes, priced in the $3.5 to $15 million range. These processors compete in the highly competitive engineering and scientific mainframe market, with products from IBM (the 3090 Vector family) and Amdahl (5890-300 series). Not only will this product be faster than the equivalent IBM machine, but also one-third to one-half smaller physically.

- NAS was also active in expanding the third-party maintenance activities which it began in late 1984. NAS made major TPM agreements with Sequent Computer Systems Inc. (a high-performance superminicomputer manufacturer, based on NAS' parent company's Series 32000 microprocessor) in April 1986 and with Telex Computer Products (for its Shamrock Tape Drive product line). NAS third-party maintenance revenues grew to $10-15 million in 1985.

- NAS also introduced a special OEM, reseller, and end-user service called SPECTRUM, which provides installation, maintenance, service, and support functions to OEMs and resellers without their own in-house service organization and to end users of non-NAS equipment.

SERVICE DEMOGRAPHICS

- INPUT estimates that NAS Customer Service and Support contributed $140 million in service revenues (see Exhibit IV-G-1). Furthermore, INPUT estimates that NAS employes approximately 600 people as hardware engineers and software support specialists.

- NAS has 75 service locations in addition to a centralized Support Center in San Diego (CA) and a Corporate Resource (parts) Center in San Jose (CA), in total supporting an inventory of over 780,000 independent parts, 14,000 of which are located at San Jose.

- NAS recently changed its overnight spare parts freight carrier to CF Air Freight from Burlington Northern, which is used by Amdahl.

SERVICE DELIVERY

- NAS offers standard hardware maintenance coverage 24 hours a day, 7 days a week, with a specified response time goal of four hours or less within 50 miles of a service center (although INPUT has found that NAS actually responds within one hour). Users can opt for reduced coverage (11x5) for a 28% discount over standard coverage.

- In case of a hardware problem, the user contacts the National Support Center, which automatically dispatches a customer service representative (CSR). While on-site, the CSR can contact the Support Center to confirm diagnosis or receive additional technical assistance.

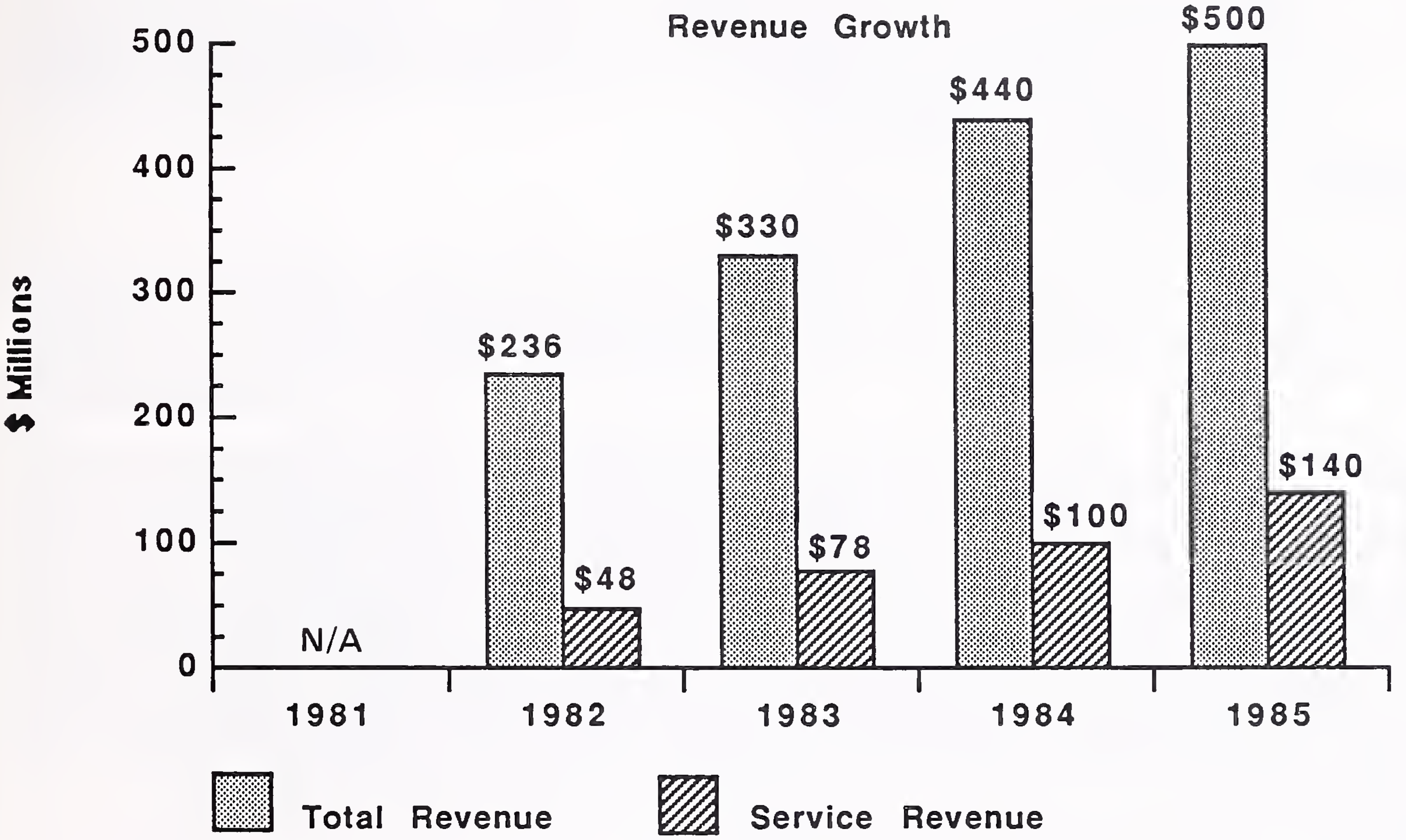
- Users contact the same Support Center in the event of a software problem. A Customer Interface Representative (CIR) fields the call and, in some instances, provides information to allow the user to continue processing. The CIR has access to problems data bases that provide necessary technical information on potential problems and solutions.

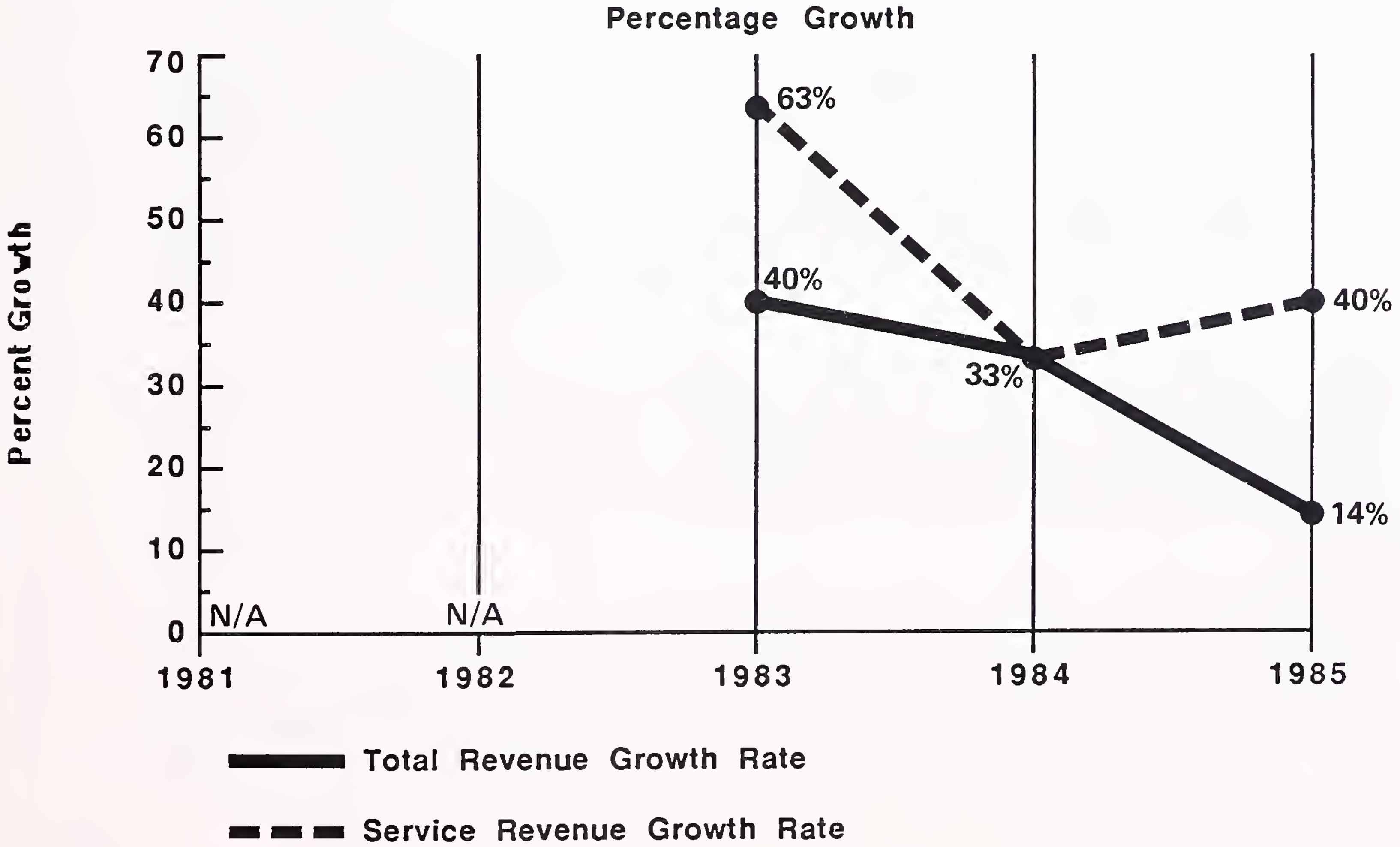
- If the CIR cannot resolve the problem, the call is escalated to a National Software Support Specialist, who, in addition to software expertise, is also trained in hardware architecture and microcode. The National Software Support Specialist works closely with regional software specialists to assure prompt and complete resolution of software problems. In addition, certain software problems can be resolved remotely, handled through a link with the remote console.

- Like many other vendors, NAS has recognized that they exist in an increasingly competitive marketplace. As a result, NAS has unbundled certain pre- and post-sale support offerings, such as consulting, training, and planning. In addition, NAS offers a reduced price, reduced service period of coverage for price-sensitive customers.

EXHIBIT IV-G-1

NATIONAL ADVANCED SYSTEMS' REVENUE AND PERCENTAGE GROWTH





- At the same time, NAS has correctly identified the highest priority of large-scale computer system users (all computer users, in fact) as being extremely high system availability. Thus, NAS offers as complete a service package as possible in its Total Support offering. This service option includes a wide range of hardware and software support services combined with third-party maintenance offerings. Through Total Support, NAS has been able to maintain high user satisfaction with service and support while assuring a high percentage of account control.

SERVICE DIRECTIONS

- NAS has focused its service delivery on users with high service requirements. As a result, NAS was successful in providing premium levels of service to users attracted to high systems availability and single-source maintenance. By doing so, NAS avoided competing with other vendors on a price-alone basis.

- Although NAS prices services competitively, market pressures concerning maintenance prices will require that NAS find ways to control costs while maintaining or even lowering service prices. A primary area open to improved efficiencies is service logistics, including dispatching, parts inventory, and other service management. NAS is not implementing a centralized dispatching system and has recently switched over to another spares air freight deliverer (CF Air Freight). Logistics control should be an extremely critical area for NAS, considering the high cost of spare parts coupled with the importance that large systems users place on their accessibility.

SERVICE VENDOR PROFILE

NCR CORPORATION
1700 South Patterson Boulevard
Dayton, OH 45479

President: Charles E. Exley, Jr.
Vice President, Corporate Customer Services: V. F. Bean
Vice President, Domestic Customer Services: Richard B. Reese
Revenues, Fiscal Year 1985: $4.32 Billion

BACKGROUND

- NCR Corporation develops, manufactures, markets, and services business information processing systems. Its products can generally be classified into the following categories: general purpose computer systems (mainframes, minicomputers, and microcomputers); industry-specific workstations for retail, financial, manufacturing, and other market places; data communications products; micrographic systems; business forms and supplies; data processing services; semiconductor products and other components; and customer services, including hardware maintenance and software support. From its very beginning in 1884, NCR has been a leader in information processing equipment for the business world, first in the area of cash registers, through the 1920s with a more versatile transaction processor (the Class 2000), and into more clearly recognizable computer products, such as the NCR 304 of the 1950s.

- 1985 was a trying year for NCR, as it was for most companies in the computer industry. Hardest hit were the microcomputer, semiconductor and component, and office automation systems markets. Growth areas included the retail terminal market and larger systems market, spurred by significant product introductions such as two new superminicomputers, the 9400 and 9500, which utilize NCR's 32-bit VLSI chip technology. NCR also added two supermicrocomputers to its Tower line and a specialized retail microcomputer aimed at smaller retail distributors.

- In 1986, NCR introduced the 9800, a modular-designed mainframe that utilizes open-ended system architecture, assuring efficient performance, high reliability, and ease of expansion. Based also on the 32-bit VLSI technology, this multi-processor utilizes the very latest in remote diagnostic capabilities through three regional support centers located in Dayton (OH), Atlanta (GA), and San Diego (CA).

- The company has also been active in increasing its presence in the third-party maintenance market, signing agreements with NEC, Zenith, and Digital Controls to name a few. NCR, which entered the TPM market just three years ago, now services an extensive list of over 60 manufacturers. INPUT estimates that NCR derives between $5 and $10 million in TPM revenues.

SERVICE DEMOGRAPHICS

- NCR derived $1.5 billion in service revenues in 1985, up 15% from 1984 (see Exhibit IV-H-1). This total includes revenues derived from telecommunications and data processing services. Principal reasons for this growth were increased activity in third-party maintenance and improved efficiencies in overall service delivery, such as the increased use of remote diagnostics used in the 9XXX series.

- NCR employs approximately 6,000 engineers working out of 330 service locations in the U.S. In addition, NCR has 15 additional refurbishment/depot locations and three regional response/dispatch centers located in Dayton, Atlanta, and San Diego.

- Atlanta is also the location of the Worldwide Service Parts Center, which stocks over 80,000 different types of parts in a 225,000 square foot facility. An automated parts handling and distribution system tracks on-hand inventory levels and parts use for each of NCR's major service locations. Each step of the in-process parts movement is tracked by the on-line computer system.

SERVICE DELIVERY

- NCR utilizes centralized dispatching which users can access through a national toll-free number. These calls are automatically routed to the appropriate regional response/dispatch center, where call screening and telephone support begins. If required, an NCR field engineer is dispatched, with a corporate-wide goal of four-hour (or less) response to 90% of all calls. Furthermore, NCR strives to complete repairs for 90% of all service requests within eight hours.

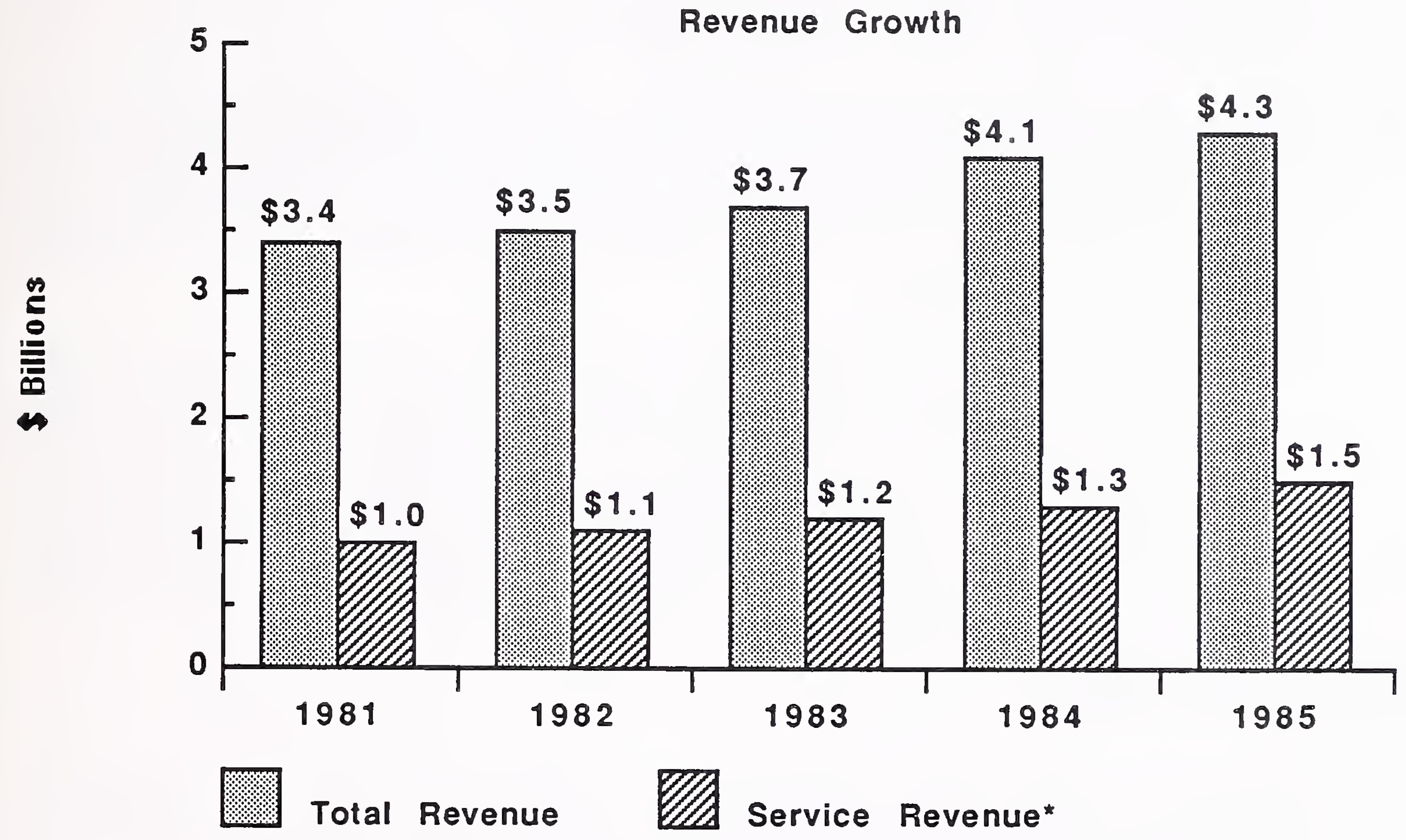
- As previously noted, NCR has actively moved toward remote diagnostics and support. Systems software, for example, is handled through an automated support line called Central Service On-line Dispatch and Reporting System (CODAR). This system is committed to respond to 75% of all calls within 15 minutes and to 75% of these calls solved with an answer called back to the user within one working day.

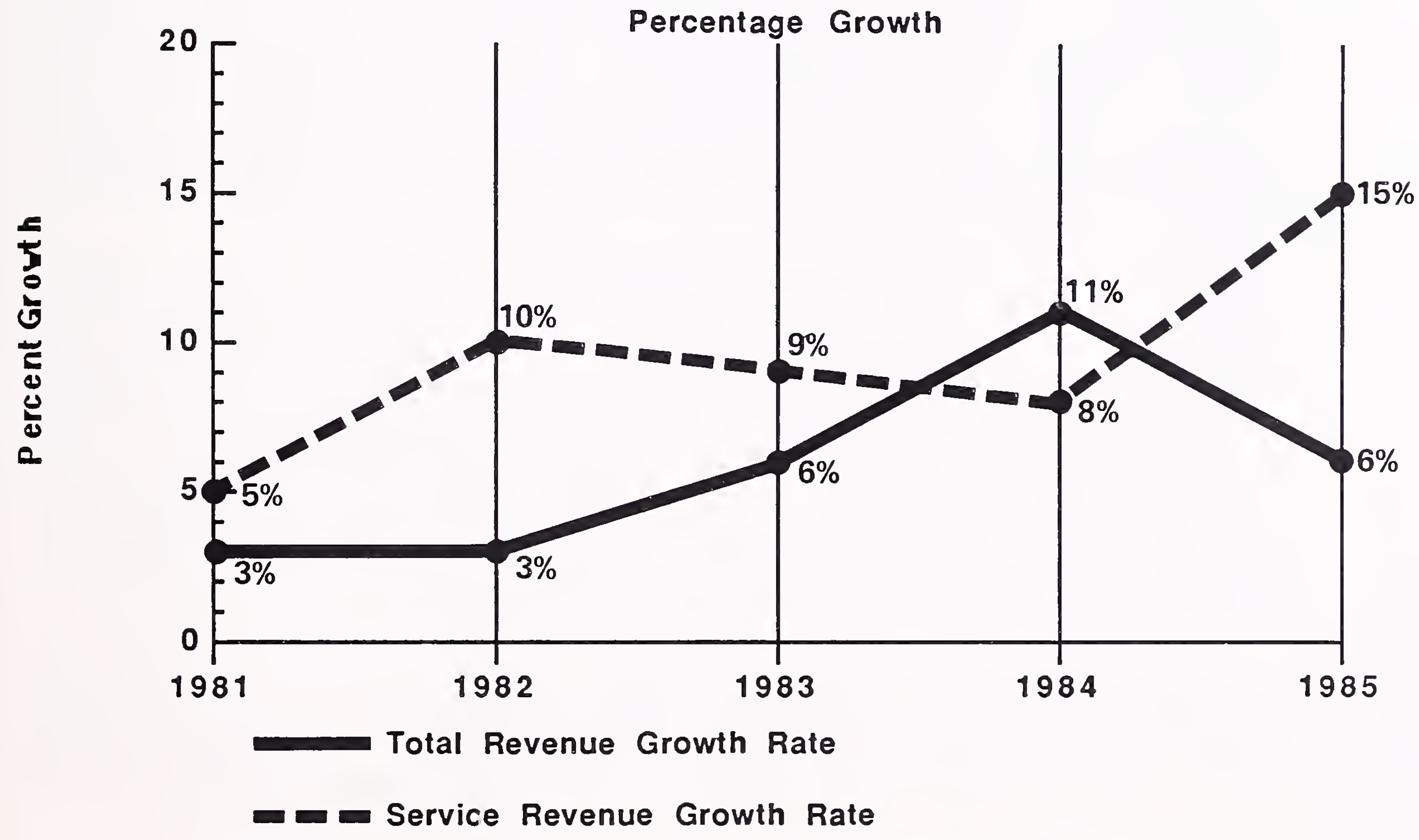
- Remote support is also key to the success of the recently announced 9800 multi-processor mainframe. Hardware and software problems are diagnosed on a scheduled, periodic, or emergency basis. Analysis of error logs is performed at the remote center. Some problems, such as operational errors and microcode adjustments, can be resolved by telephone. If the problem requires on-site attention, the system automatically forwards necessary technical and parts information to the local service representative. And at all times, data security is ensured through agreement and controlled by the user.

- An area that NCR emphasizes in its Customer Service Division is education and training services provided both to NCR and customer personnel. NCR conducts over 100,000 student-days of training at its Central Technical

EXHIBIT IV-H-1

NCR CORPORATION'S REVENUE AND PERCENTAGE GROWTH





*Service revenue consists of customer services, including hardware and software maintenance, data processing services, and telecommunications services.

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Education Center (CENTEC) in Dayton. In addition, NCR offers regional training facilities at local service locations, and routinely sends instructors to customer installation sites to train users of new systems. Also, NCR offers a wide range of educational service formats, such as teleconferencing, video disk, and computer-aided instruction (CAI).

- NCR is also active in providing a wide range of professional services to its customers, such as site planning and preparation, programming assistance, and specialized consulting services. NCR has followed an industry-wide trend toward keeping service prices low through unbundling a number of these services, allowing customers to choose the amount of additional pre- and post-installation support needed.

- As mentioned previously, NCR has actively pursued third-party maintenance as a method of increasing service business, improving field efficiency, and protecting its installed customer base. NCR emphasizes that third-party customers receive the same quality service that NCR customers receive, both TPM and systems customers sharing the same service operations and logistics processes. NCR's Worldwide Service Parts Center also stores and tracks parts for over 200 products produced by the 60 manufacturers for which NCR provides third-party service.

SERVICE DIRECTIONS

- NCR is emerging from the computer industry slump with an increased awareness of the need to properly target specific high-growth markets in which the company can deal with strength, particularly the retail, financial, and manufacturing industries. NCR has strengthened this focus with product introductions in high-growth product segments, such as the fault tolerant large system market (the 9800) and the supermicrocomputer market (the Tower series). In addition, NCR has redirected its microcomputer efforts into its area of expertise, the retail market, by teaming with third-party applications software vendors to offer specialized vertical market systems (such as hospitality systems built around its PC6 and PC8 microcomputers).

- NCR also underwent an organizational change to help turn around microcomputer and office automation operations with the formation of two new groups, the Computer Systems and Business Systems Divisions. The Computer Systems Division will be composed of the company's special purpose business unit, office information business unit, and federal systems business unit. The Business Systems Division will focus on marketing general purpose systems to vertical industry markets. Another new organization named Product Marketing and Support will focus on product marketing sales education, systems integration, and other marketing functions. All of these new divisions point to a new emphasis on retargeting vertical markets.

- In service, NCR will continue to emphasize holding the line on service price increases through the unbundling of additional support services and through improvements in the delivery of service in general. Key steps in these improvements will be the increased use of remote support services, particularly to users who are becoming increasingly educated to the benefits of remote diagnostics in maintaining high levels of systems availability.

- In addition, NCR will undoubtedly need to market support services that are increasingly industry-specific, particularly in the areas of education, training, and professional services. User price sensitivity and overall acceptance of service offerings such as capacity planning, systems integration, and network planning which are tailored to their specific industry application will be much more favorable than the general purpose application as a whole.

SERVICE VENDOR PROFILE

SPERRY CORPORATION 1290 Avenue of the Americas New York, NY 10104	President and COO: Joseph Kroger Vice President, Vince M. Donovan Revenues, Fiscal Year 1986: $5.8 Billion

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BACKGROUND

- In May 1986, Sperry finally relented to the determined acquisition attempts of Burroughs Corporation and agreed to a $4.8 billion, $76.50 per share deal, culminating a year's pursuit by Burroughs Chairman W. Michael Blumenthal. While Sperry was obviously a prime acquisition candidate (a Sperry-Honeywell deal was also rumored), at times the Burroughs attempt approached the hostile takeover level. In the end, the combined Burroughs-Sperry corporation will result in a $10.7 billion, 138,000 employee player in the computer, electronics, and defense industries, overtaking Digital Equipment Corporation as the number two computer manufacturer (after IBM).

- While the combined company may be large, there has been much conjecture concerning the "closeness of fit" between the corporations. While both manufacturers' strengths lie in the mainframe product lines, Sperry's strong suit is in the government industry segment while Burroughs has a much greater presence in the commercial market. Furthermore, there is no existing compatibility between their previously competitive computer systems, suggesting to some that this merger may follow the same path as the failed Sperry-RCA and Honeywell-GE mergers.

- In addition, the new company will need to successfully meld two opposing corporate cultures--Burroughs being much more businesslike while Sperry is more relaxed. More than a few feathers were ruffled during the takeover attempt, creating a need to alleviate problems in areas such as managerial and worker concerns over job security and corporate direction, especially in light of the obvious need to eliminate redundant activities in such areas as marketing, research and development, and administration.

- Sperry users have already voiced concerns about the merger, demanding assurances that they will not be abandoned in the wake of the takeover. Burroughs Chairman Blumenthal addressed these concerns by stating that neither group of users (Burroughs or Sperry) would be forced to convert their systems over to the other.

- Currently, representatives of both Burroughs and Sperry are still debating the final shape of the combined company. Indications are that a single organization will evolve, requiring the combining of many organizational functions and inevitable staff reductions. In the meantime, both companies are acting independently.

- Prior to the merger, Sperry had just gone through a period of tightening its belt through the divestiture of noncomputer, nonelectronics, and nondefense products. Sperry sold its farm equipment division to Ford Motor Company and focused its attention on extending its product line downward. While Sperry had been primarily a mainframe manufacturer, sales growth in the industry was greater in smaller systems. Popular new systems, such as the mid-range mainframe System 80 and the Mitsubishi-manufactured PC-AT-compatible microcomputers, have improved sales.

- Sperry also negotiated a deal with Hitachi, Ltd. under which the Japanese firm would co-develop Sperry's successors to the four-year-old 1100/90 mainframe series, utilizing Hitachi-built circuits and subsystems and providing major subassemblies and components to Sperry for final assembly in the U.S. This link comes on the heels of the abandoned Trilogy Systems partnership which was supposed to result in a wafer-scale-based replacement for Sperry's mainframe products. Hitachi already manufactures mainframes and peripherals for National Advanced Systems to be sold in the U.S.

SERVICE DEMOGRAPHICS

- Sperry offers service out of 200 service locations nationwide, 62 of which act as mail-in/carry-in depot locations. Sperry has a centralized software support center which offers toll-free telephone support for all products.

- Sperry employs 3,500 field engineers and an additional 1,500 technical support specialists. These support personnel are shared between service activities involving Sperry products and those involving third-party maintenance customers.

- While revenue information concerning Sperry is difficult to obtain due to the Burroughs acquisition, INPUT estimates that Sperry's service revenues exceeded $1 billion in 1986. Combined with Burroughs, the total service revenue of the resulting service organization is estimated to be $2.1 billion.

SERVICE DELIVERY

- Sperry offers hardware maintenance services for processors between the hours of 7 a.m. and 6 p.m., Monday through Friday (excluding holidays). Sperry will extend the principal period of maintenance a maximum of two hours for a premium of 5% over the base monthly maintenance charge. In addition, Sperry offers a wide variety of additional hours and days of coverage, up to and including 7-day, 24-hour coverage at a premium fee of 165% of the base monthly maintenance charge.

- Sperry contract customers do not pay for parts (whether inside or outside of contracted hours) or mileage (except for Sperry equipment sold by a systems house).

- Peripheral coverage is similar, except for aditional zone charges billed if the service call occurs outside of the prime shift coverage (7 a.m. to 6 p.m., Monday through Friday). Peripheral users may contract for an additional two hours of coverage for a 10% premium; all other hours are billed on a time-and-material basis.

- Large installation users with two or more processors (e.g., 1100, 90/60, etc.) of the same type receive extended maintenance coverage at a reduced premium level from single-processor installations. For example, a two processor installation can receive 7-day, 24-hour coverage for a 52% premium, compared to 65% for a single-processor installation. A three (or more)-processor installation pays a 41% premium for the same extended coverage.

- Sperry provides basic software support via a centralized telephone support center. Support provided ranges from periodic analysis of error logs to the actual downline loading of new releases, updates, and patches. Users are expected to provide Sperry with an up-to-date system profile, which includes information about the program products and revision levels at each site.

- Sperry offers remote diagnostics on its 1100 series and System 80 mainframes through its facility in Roseville (MN). A dedicated, toll-free WATS line provides around-the-clock access to on-site and remote library testing programs. Data bases at Roseville contain historical information on updates, upgrades, and problem histories, with appropriate corrective actions. In addition, system performance standards are accessible for each system.

- Sperry has unbundled educational services for its customers, offering a wide range of educational courses available at both the user's site or a Sperry location at prices ranging from $100 to $2,800 per student. In addition, Sperry makes available to users a complete library of educational materials.

SERVICE DIRECTIONS

- It is difficult to project the future of Sperry's service organization without taking into account the enormous task of combining the large and seemingly disparate organizations of Burroughs and Sperry. Both users of Sperry equipment and employees of Sperry have expressed concern over the merger, and while executives of both companies have publicly addressed these concerns, it is inevitable that significant cuts and changes are awaiting Sperry.

- For the time being, both organizations will operate fairly autonomously, providing "business as usual" service and support to their user bases. Eventually, the organizations will have to meld to assure consistency in policy and to reduce inefficiencies of redundant activity.

SERVICE VENDOR PROFILE

TANDEM COMPUTERS INC.
19333 Vallco Parkway
Cupertino, CA 95014

President and CEO: James G. Treybig
Director, Customer Engineering:
Roger Bier
Revenues, Fiscal Year 1985:
$624.1 Million

BACKGROUND

- Tandem Computers Inc. designs, develops, manufactures, markets, and supports a family of computer systems and networks for on-line transaction processing. To better meet the high system availability needs of transaction processing, Tandem systems emphasize both fault tolerance and modular growth design. Tandem manufactures the Non-stop EXT, Non-stop II, Non-stop TXP, and Non-stop VLX superminicomputer systems along with a pair of 80286-based, MS-DOS desktop microcomputers called the 6AX/20 ($3,995) and the 6AX/40 ($4,495).

- The fault tolerant market is heating up as the next major battlefield for computer manufacturers, with Tandem recognized as an early leader. Other market players include Stratus Computer Inc. of Natick (MA) and IBM, which sells the Stratus machine under the System/88 label. Tandem also faces competition from a growing list of small startup companies with low-priced multiprocessor and fault tolerant systems. As a result, Tandem broadened its product line in 1985 with entry-level EXT and in early 1986 with the introduction of higher power VLX with twice the processing power of the TXP.

SERVICE DEMOGRAPHICS

- Tandem offers service out of 133 field offices worldwide. Tandem employs 950 people in service, including a hardware customer engineer population of 700.

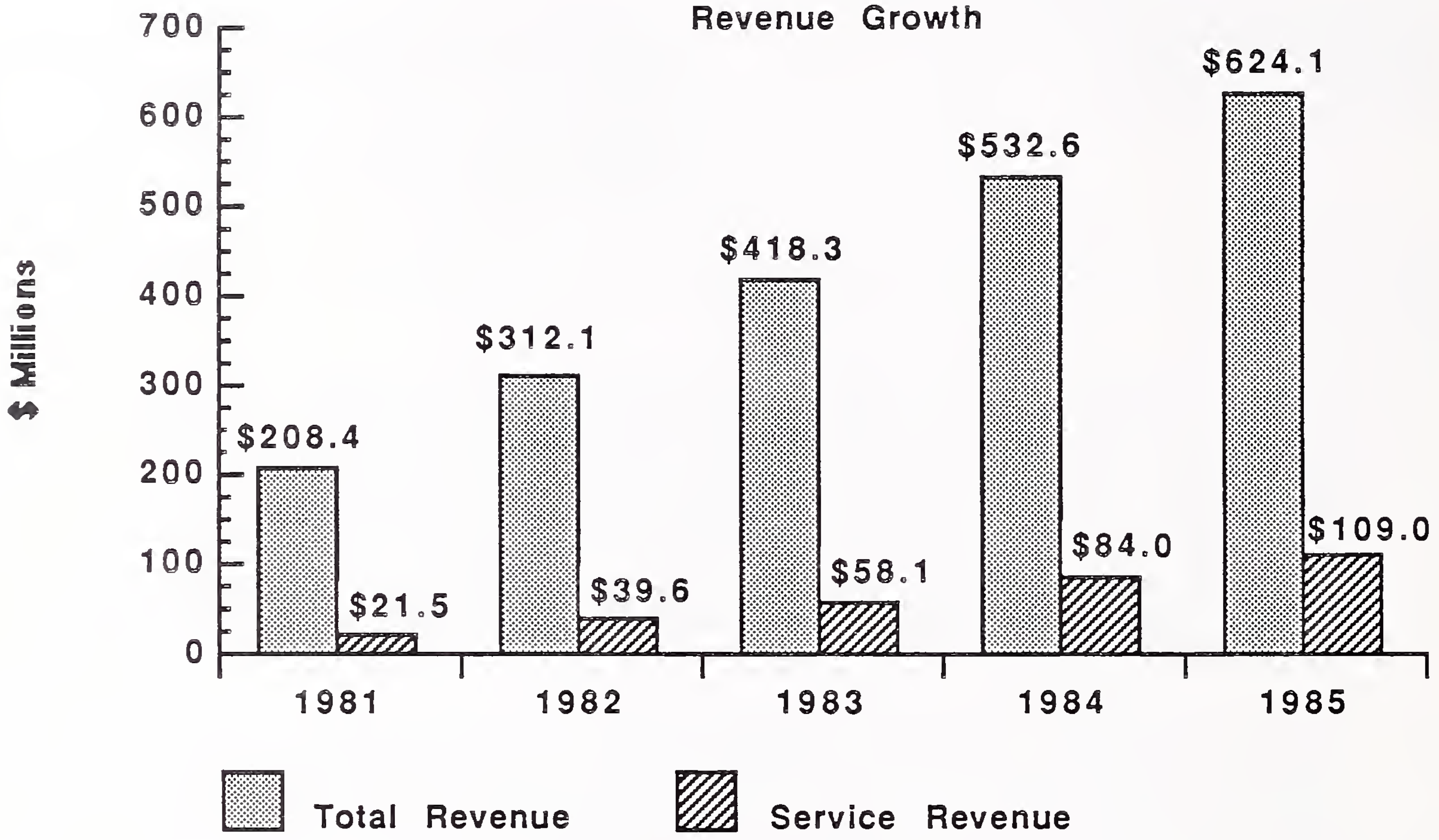
- Exhibit IV-J-1 shows Tandem's total revenue and service revenue growth for the last five years.

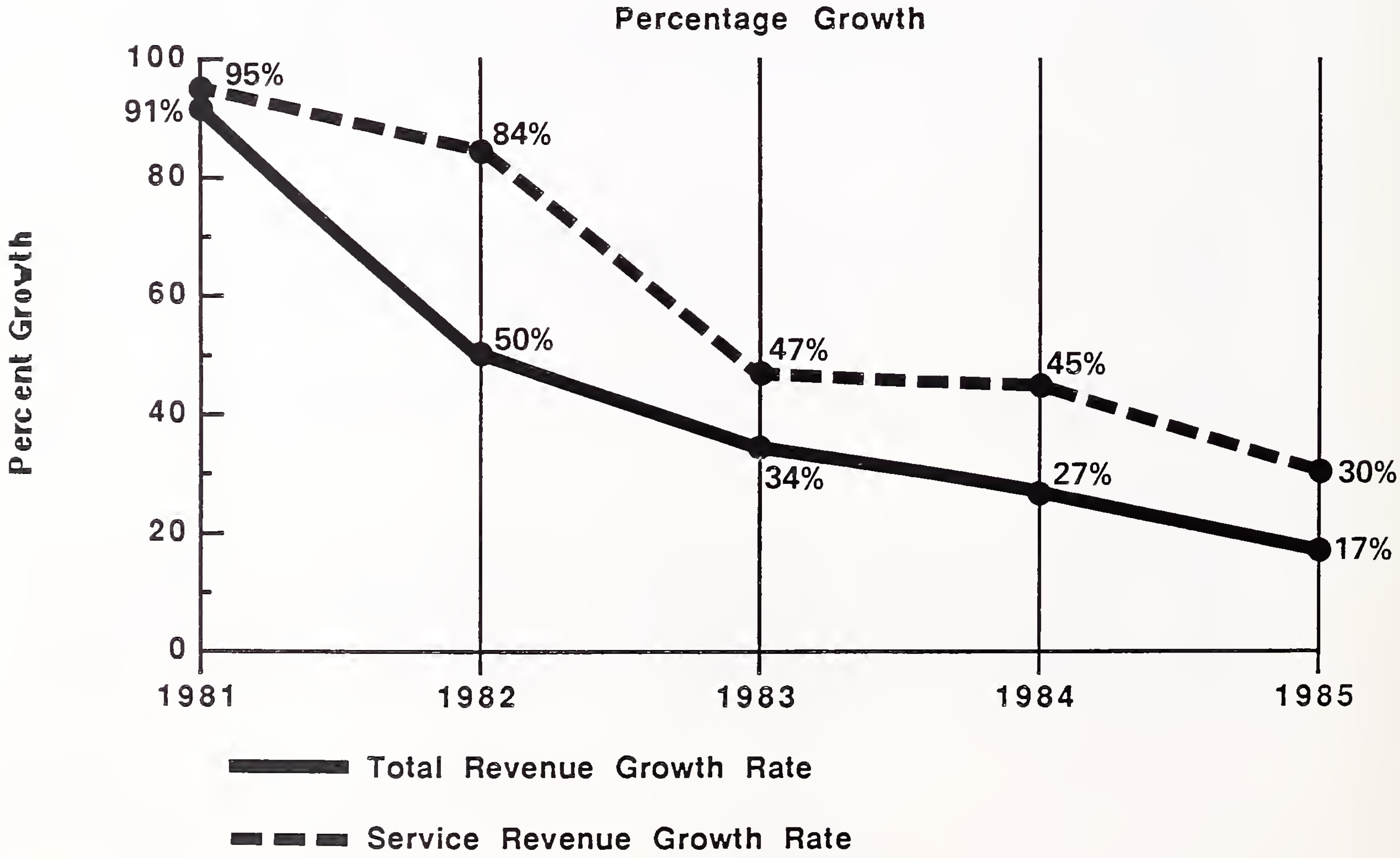
SERVICE DELIVERY

- Tandem offers service contracts that are tailored to best fit its customers' needs. Large installations typically opt for a dedicated field engineer on-site. Usually, customers receive prime shift coverage (8 a.m. to 5 p.m., Monday through Friday), although second and third shift coverage is available, as is 24-hour, 7-day per week coverage.

EXHIBIT IV-J-1

TANDEM COMPUTERS INC.'S REVENUE AND PERCENTAGE GROWTH





- Smaller installations typically contract for local field engineer coverage, with each FE handling an average of three sites. These users usually receive four-hour (or better) response, unless the user site is over 100 miles from a service location. Users can upgrade this response to two-hour (or four-hour, if outside the 100-mile distance) for a premium.

- Users place their requests for service by calling Tandem's National Dispatch Center, which offers toll-free, 24-hour, 7-day dispatching and support capabilities. Not only does the automated NDC provide dispatching and service management functions, but it also handles call escalation and, if the problem is extended due to an unavailable spare part, the system automatically creates an Emergency Parts Order report at call close, ordering the needed spare on a priority 24- or 48-hour delivery.

- The NDC also provides vital diagnostic capabilities through Tandem's use of expert systems. Software installed at the NDC logs and stores data about the operations and status at each installation. A customer engineer can remotely access this data base of information to aid in the diagnosis of a user's system.

- Systems software is provided to users in the form of updates (both software and documentation) and remedial maintenance activities which will verify the problem's existence, provide a patch (or temporary workaround), provide a statement indicating that a future revision will correct the problem, or issue a statement that a problem cannot be resolved.

- In recognition of the increasing price sensitivity of users toward hardware maintenance prices, Tandem offers a low-priced option called Central Site Repair, which provides on-site service at a centralized designated user location where users transport units to be repaired. This option reduces the costs of supporting dispersed equipment, such as terminals, workstations, and small (transportable) systems; thus, Tandem can transfer these cost savings back to the user. Tandem also offers mail-in repair called Express Exchange on workstations. This option requires users remove and send in the defective board, receiving assistance from telephone support personnel.

SERVICE DIRECTIONS

- Tandem hopes to demonstrate its commitment to the quality of service provided by continuing to improve its service offerings, demonstrated in three specific areas:

    - Faster response times, through the introduction of its National Dispatch Center (NDC) and through increased use of remote support utilizing expert systems.

    - More flexible customized sevice options which allow users to choose the correct service level that fits their support requirements and their budget.

  - Increased use of new technology to reduce the cost of service per transaction (e.g., the VLX is three times as reliable as the TXP, while having half of the maintenance costs).

- In recognition of the growing importance of software support and its role in the satisfaction of users' requirements for a more complete support package, Tandem has begun a pilot program to cross-train customer engineers to perform first-level software support activities.

V LARGE SYSTEMS SERVICE MARKET ANALYSIS

A. SERVICE MARKET ANALYSIS, 1986-1991

- As shown in Exhibit V-1, the overall U.S. customer services market, excluding the third-party maintenance market (which will be covered later in this section) is $ 13.6 billion in 1986. This estimate reflects the slowed new product sales growth felt in most segments of the computer industry, particularly in the large systems market. Primary contributors to this slowed growth include:

    - An overall downturn in the computer systems and information services marketplaces starting in 1985 and continuing into 1986.

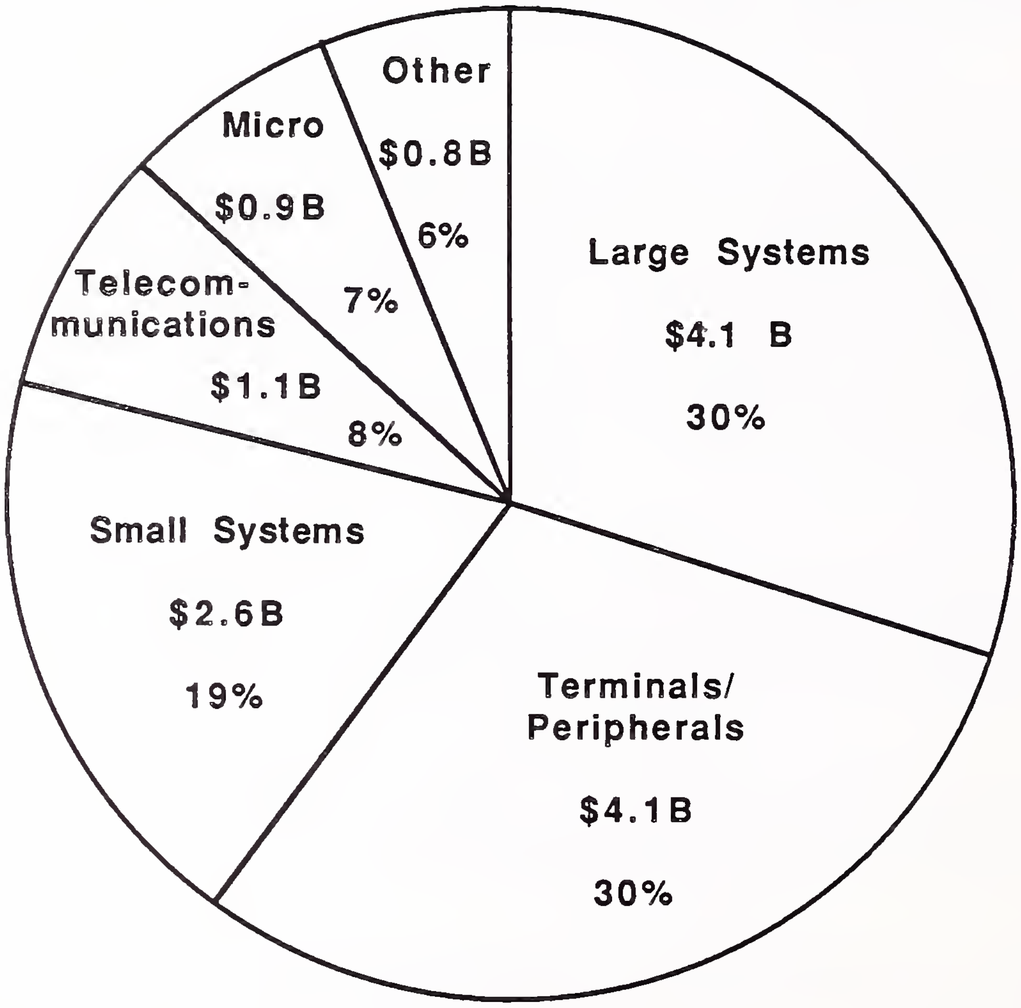
    - Decreased capital spending by medium- and large-sized corporations, which lengthened new product sales cycles.

    - Increased competition for the domestic systems market, caused by an expansion of the number of lower-priced alternatives available for each requirement, dividing the same "pie" into smaller "slices."

- This continued slowdown was also reflected by continued layoffs at major computer manufacturers, such as Data General, Wang, Honeywell, and the newly formed Unisys (formed from the merger of Burroughs and Sperry), to name a few. Even such traditional "full employment" vendors as Hewlett-

EXHIBIT V-1

1986 CUSTOMER SERVICE USER EXPENDITURES*
($ BILLIONS)



Total U.S. Service User Expenditures in 1986: $13.6 Billion

*Excluding TPM expenditures, special purpose systems, and user self-maintenance.

Packard and IBM have frozen new hiring and encouraged attrition through early retirement programs to lower costs. HP, for example, instituted a well publicized "voluntary early retirement" program that reduced the employment by approximately 1,500. And IBM, who has not had layoffs since the depression, reduced the number of college graduate hires and reassigned existing employees to revenue generating positions, both actions demonstrating a increased concern over the current economic state in the industry and at IBM.

- Throughout the slowdown in new product shipment growth, customer service growth has been fairly constant and steady. More significantly, the customer service organizations of most, if not all, computer manufacturers have been profitable. In fact, the customer service operations are often one of the few profitable parts of computer vendors, which led to the spinning off of the customer service organizations of at least two significant manufacturers, Datapoint and Mohawk Data Sciences, in 1985. This profit contribution has increased the importance of service, and service efficiency in computer companies and, as a result, should continue the expected service growth in the next five years.

- Exhibit V-1 also provides a breakdown of the overall customer services market by product type. Not surprisingly, the large systems (mainframe) segment, along with the peripherals segment (which is predominantly attached to large systems), is the largest segment of the overall market, constituting 60% of the total. The large systems market is currently the largest individual segment, at $4.1 billion in 1986, for a number of reasons:

    - Large systems users are least price-sensitive due to their large capital investment in their systems, both in a purchase sense and in the value of processing performed.

    - Even though typical service price to purchase price percentages are only in the 2-6% range, the initial purchase prices start at $350,000, and fully configured systems easily exceed $15 million. Therefore, a single service contract can bring in up to $9 million a year.

  - User reliance on service in this segment is greatest, creating a large "aftermarket" requirement for additional support services, particularly in the highly profitable areas of consulting, training, and software support. Large systems service providers have responded to this by expanding their service offerings and by unbundling these services, making it easier to effectively (and profitably) price these services.

- The peripherals market is large due to the vast quantity of products that exist and require support. And while the purchase prices and the resulting service costs, are nowhere near those of large systems, the sheer number of "boxes" installed contribute $4.1 billion in service revenues in 1986. Again, those peripherals attached to large systems contribute the largest share, since large systems logically can support more peripherals to begin with. Equally as important, users of large systems place greater importance on the system availability of their peripherals than users of smaller systems and, therefore, are less price sensitive than smaller systems users.

- The small systems segment is comprised of products ranging in price and capabilities from small business systems, such as the DEC PDP 11s that can start at $15,000, up to superminicomputer systems that rival mainframes in power and cost $500,000 and up. While the traditional minicomputer market has shown only marginal growth, the superminicomputer segment has exhibited growth in specific marketplaces, such as the scientific and engineering markets, as well as commercial users interested in the improved price/performance of these new computers. The company that has taken best advantage of this interest has been DEC with its new VAX 8XXX product line.

- The telecommunications segment of the overall market is one that promises high growth while, at the same time, is very difficult to define currently. INPUT examines the separately billed segment of the market that encompasses "standalone" (or those products not within the DP system) products. These products, predominantly modems, multiplexors, PBXs, local area networks, earth stations, and dish antennas, currently receive little direct support.

- Modems and multiplexors are predominantly hardware-oriented, with typical support delivered in the form of depot maintenance. Product prices are relatively low, and product (hardware) reliability is extremely high.

- Local area networks (LANs) are predominantly software-oriented, with typical support in the form of operational training and, when necessary, mailed revisions and fixes.

- PBXs are a mix of hardware and software, requiring the closest blend of support to that needed in the DP world. Thus, support is usually provided on-site, with emphasis placed on timely response and repair times.

- Given this perspective, the current market size of $1.1 billion may appear small. However, the rapid development of new products within this segment, spurred by the promise of increased coordination and connectivity with traditional DP functions, suggests that service and support functions should grow very rapidly. Early indications of this development already exist:

  - User requirements for service and support, particularly in the areas of planning, training, and consulting, are increasing rapidly. User dissatisfaction with the current state of telecommunications support has moved a number of users to perform the support themselves, leaving potential support revenues "on the table" while doing little to increase user satisfaction with the vendor or the product.

  - Some vendors are already recognizing and addressing this increased requirement for service by increasing the amount of service options and, at the same time, marketing these new services in such a way that demonstrates their increased importance. Vendors who have already instituted programs in this direction include Pacific Telesis and AT&T.

- TPM interest and activity has increased dramatically in the last year, as larger TPM organizations recognize the increased opportunity resulting from the growing disparity between user requirements for service and manufacturers' offerings. Furthermore, the mixed-shop nature of telecommunications systems lends itself well to TPM.

- The main obstacles to further TPM penetration into this market have been the slow development of service expertise and access to technology (e.g., remote and other forms of diagnostics, particularly on mixed-vendor networks).

- Historically, the early explosive growth in the microcomputer market caused much optimism concerning the potential for add-on services and products, including service. While some argued that rapidly declining prices and improved reliability would transform the micro into a disposable commodity, others felt that the rapidly growing product base offered unlimited growth potential.

- To some degree, both groups were correct. Prices did fall dramatically, and the products did become more reliable. At the same time, the expanding product base and increasing economies of scale made it more economical to provide timely on-site support to business users. However, the "disposable" micro did not appear, since business users continued to find larger and more sophisticated applications for their micros and vendors increased the capabilities of their "standard configuration" systems, thus maintaining essentially stable prices (a standard business-use system, while much more powerful, has essentially stayed in the $2,000 to $3,000 range). Furthermore, certain applications required on-site attention, particularly if the internal memory size prohibited the simple replacement of the failed unit or if the user was involved in a connected application (e.g., micro-to-mainframe or micro-LAN application).

- At the same time, the micro service market did not develop to the optimistic expectations of others, in part due to a trailing off of the micro market. The micro manufacturers and service vendors also had to share in the blame. Few manufacturers established extensive service delivery offerings, preferring to place the responsibility on the distribution source, other third parties, or the end users themselves. After first establishing service pricing as a percentage of the purchase price (typically 15-20%), the resulting prices appeared excessive to a large percentage of users. By the time that users began to recognize the importance of service, service providers had already begun to price service so competitively low that few vendors could make sufficient margin on micro service. And perhaps the most glaring mistake in micro services was the service franchise effort, which overestimated the "walk-in" service potential, underestimated the costs involved in setting up a service operation, and eventually found its potential market base consumed by manufacturers, TPMs, and retail distributors.

- On the surface, the micro service market appears large, almost limitless. On closer examination, the market should be broken down into the major CPU manufacturers of IBM, Apple, and the "clones" (PC- and XT-"workalikes"). Then, the market should be further broken down into the peripherals commonly found at micro sites (this number easily exceeds 100). Of course, this breakdown does not take into account the hundreds of various software packages possibly located at each site. It becomes apparent that the resulting breakdowns indicate that possible product densities can become quite small. To properly cover such a dispersed service population can place unreasonable demands on resources, particularly spare parts.

- Still, the picture is not completely bleak. First of all, there is an exceedingly large base of micro users in business use that has become less dispersed (thus less costly to support). Large corporate usage has become increasingly centralized to the extent that corporate MIS now includes the function of microcomputer management. Applications involving micro connectivity require more complete support offerings, with less price sensitivity as a result. And the increased use of micros in smaller business applications (e.g., small retailers using micros for cash register/inventory management/accounting functions) spawns a new and growing market for vertically-oriented support services.

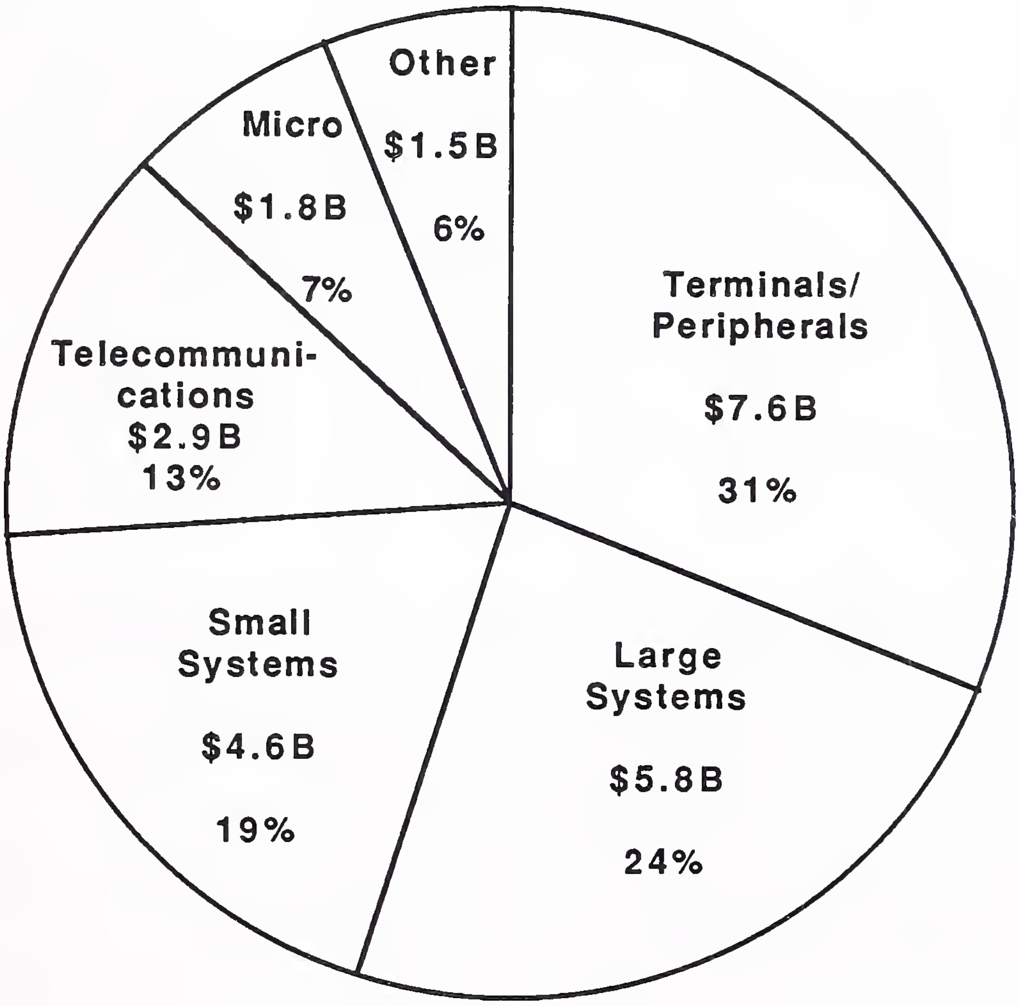
- By 1991, the overall customer service market composition will change, as shown in Exhibit V-2, reflecting the growth of telecommunications service as more users take advantage of the increased use of networked systems. This is not to suggest that mainframe products are going to be replaced by networked departmental systems. Rather, corporate users will bridge smaller systems more efficiently with centralized mainframes, allowing complete downline loading and uploading of data from the corporate data bases.

- It is safe to expect that mainframe service growth will continue to be slow as manufacturers continue to price service aggressively in order to attract customers. In addition, mainframe service operation efficiency will continue, allowing vendors to continue to price service more competitively while still maintaining healthy service margins. Increased use of remote support services, coupled with continued development of multiprocessor systems, should keep prices at or below 2% of purchase price, while competitive forces (including increased competition from superminicomputer manufacturers) should maintain or even lower purchase prices.

- An existing trend that should continue well into the forecast period is the hesitancy of users to purchase larger systems, preferring to add memory to their existing system until economic conditions improve or until a significantly advanced product emerges that warrants the new purchase. As a result, peripheral sales and service should continue to grow. In fact, by 1991 INPUT projects that terminal/perpheral service will be the largest dollar contributor to the overall customer services market, thus giving credence to the position that many systems manufacturers take a loss on the CPU in order to make money on the peripherals, software, and services business that tags along.

EXHIBIT V-2

1991 CUSTOMER SERVICE USER EXPENDITURES* ($ BILLIONS)



Total U.S. Service User Expenditures in 1991 (Forecast): $24.2 Billion

1986-1991 AAGR: 12%

*Excluding TPM expenditures, special purpose systems, and user self-maintenance.

- Exhibit V-3 presents the expected user expenditure growth for customer services by product category. Note that while large systems growth is expected at only 7%, this area is still extremely significant on a total dollar basis ($5.8 billion by 1991 or more than twice the size of the faster growing telecommunications market). What is key, however, is that faster growing markets represent greater growth potential.

- One such market is the telecommunications product area. Currently, relatively low product prices combined with high reliability rates have made it difficult to build extensive service offerings since traditional theory assumed that users of low cost/high reliability equipment would be extremely price sensitive. This ignores two factors present in the telecommunications market:

    - Telecommunications products are an integral part of the user's total IS (information systems) strategy. Thus, when a telecommunications device (e.g., modem) goes down, the entire IS capabilities are impacted.

    - Telecommunications users have expressed an increased requirement for more and better service. While users may be sensitive toward price increases for "traditional" services (e.g., remedial maintenance), users are quite attracted to premium services, particularly in the professional services areas that improve telecommunications use. INPUT studies have shown that such services as network planning and optimization are extremely attractive to users of "mixed-shop" systems.

B. CURRENT TPM MARKET AND FORECAST, 1986-1991

- Third-party maintenance (TPM), the provision of maintenance and support services on other manufacturers' products, has become an extremely

EXHIBIT V-3

U.S. CUSTOMER SERVICE USER EXPENDITURES*
1986-1991

PRODUCT SECTOR	$ BILLIONS		1986-1991 AAGR (Percent)
	1986	1991	
Large Systems	$4.1	$5.8	7%
Small Systems	$2.6	$4.6	12%
Microcomputers	$0.9	$1.8	14%
Telecommunications	$1.1	$2.9	21%
Terminals/Peripherals	$4.1	$7.6	13%
Other	$0.8	$1.5	13%
Total	$13.6	$24.2	12%

*Excluding TPM, special purpose sytems, and user self-maintenance.

important market for both traditional "independent" suppliers of TPM and, increasingly, for manufacturers who provide support on other manufacturers products. The U.S. TPM market is currently $1.56 billion, of which independents (e.g., Sorbus, Dataserv, etc.) make up 80%, manufacturers take 15% (up from 12% in 1985), independent board repair firms (such as CPX) make up 4%, and others bring in the remaining 1%.

- Exhibit V-4 provides a product breakdown of the U.S. TPM market for 1986 and projects into 1991. Note that while TPM represents less than 10% of the total U.S. customer service market (manufacturers comprise 83% of the total $15.9 billion spent on all forms of support, special purpose systems derive 5% of the total, and users make up the remaining), TPM service is growing at a very healthy 16%.

- TPM growth will be greatest in the traditionally strong terminal/peripheral product segment. Historically, TPMs have been successful in this area for a number of reasons:

    - There are a large number of "after-market" peripheral manufacturers who have created large installed bases without the service structure to support these products. Since the CPU manufacturer rarely covered "foreign" products, TPMs were able to pick up this business without much competition. DEC was instrumental in the development of this market since distributors of DEC systems were encouraged to find ways of keeping system configuration prices down by virtually any means, including using non-DEC peripherals. Thus, the DEC-compatible market became a strong TPM market. Interestingly, DEC has taken steps to recapture this market by offering TPM service on non-DEC peripherals on DEC systems).

    - Even on peripherals manufactured by companies with strong service structures and offerings, TPMs targeted peripherals with extremely low service prices as a way of getting "their foot in the door" at that user

EXHIBIT V-4

U.S. TPM SERVICE USER EXPENDITURES
1986-1991

PRODUCT SECTOR	$ MILLIONS		1986-1991 AAGR (Percent)
	1986	1991	
Large Systems	$177	$197	2%
Small Systems	$232	$425	13%
Microcomputers	$472	$1,065	13%
Telecommunications	$172	$620	18%
Terminals/Peripherals	$447	$820	29%
Other	$60	$130	17%
Total	$1,560	$3,260	16%

site. Since terminals have relatively little to service (thus little service cost to incur), the terminal market was used extensively for this purpose.

- TPMs, led by TRW, developed "service management" philosophies that worked with manufacturers without service capabilities to provide service and sales assistance. Thus, the TPMs became (strategic) partners with these manufacturers (who were often peripheral manufacturers), and each partner hoped to benefit from the arrangement. Since the agreements were almost always multiyear, the TPMs were assuring long-term growth (long term, of course, if the manufacturer was successful in building a product base).

- The micro market was also a target largely by the default of the manufacturers. Early in the development of the micro market, the emphasis was placed on the distribution of micros. Thus, to enter the market quickly enough, many manufacturers relied on their distribution source, typically retail chains, to provide support. Even companies with large service organizations, including IBM, recognized the difficulty in supporting the dispersed product base, and as a result also relied on the distribution sources. During this time, TPMs were already in full swing in the "service management" strategy, so TPMs were able to secure long-term agreements with micro manufacturers (the most notable being the RCA/Apple agreement). Also, TPMs were able to successfully target large corporate users who preferred to deal with a nationwide TPM versus local retailers.

- By 1984, TPMs were able to collar 43% of the micro service market. About this time, manufacturers, most notably IBM, became increasingly active in the micro support area. Improved product densities, increased pressure from corporate users, and decreased price sensitivity all were factors that encouraged manufacturers to assume a more direct participation in micro service and support. Thus, manufacturers assumed 52% of the 1985 micro service market (up from 43% in 1984), causing the TPM portion of the micro service market to shrink to 34%, as shown in Exhibit V-5.

EXHIBIT V-5

TPM PENETRATION, 1986

PRODUCT SECTOR	$ MILLIONS 1986 TOTAL	$ MILLIONS 1986 TPM USER EXPENDITURES	TPM MARKET PENETRATION (Percent)
Large Systems	$4,317	$177	4%
Small Systems	$2,854	$232	8%
Microcomputers	$1,408	$472	34%
Telecommunications	$1,316	$172	13%
Terminals/Peripherals	$4,551	$447	10%
Other	$831	N/A	-

- Hardest hit by this development was the micro service franchise movement, which was led by such vendors as Serviceland (now entering Chapter 11), Computer Repair Corporation (CRC), and The Computer Doctor. Basically, service franchise efforts hoped to exploit the tremendous growth in the micro industry by repeating in service what Computerland had done in the hardware sales area. Potential franchisees would pay up-front fees and percentages of sales in order to carry a "nationwide recognizeable name," along with additional benefits in marketing and spares acquisition/management. The market would be carry-in (befitting a "storefront" business), although some franchises would emphasize on-site service to business users.

- Although a fundamental problem with the service franchise effort was the slowed growth in the marketplace, service franchises made a number of tactical errors:

    - They entered the market at a time when the manufacturers began to increase their own presence, thus the service franchises found their market being squeezed from the top by manufacturers who were targeting the large corporate users and by TPMs who had already built up nationwide recognition and service coverage, and from the bottom from retailers who had already established themselves and had the built-in advantage of selling the service contract at the time of the sale.

    - Service franchise overestimated the "allure" of storefront service, since business users (the more consistent user of service) were not attracted to carry-in service. As a result, the only franchises that had a remote chance at success were those located near a large number of small users (small businesses, individuals who used their micro for home use, university students, etc.).

- Franchises often erred in the actual placement of their service locations. One specific Serviceland was located 30 miles east of Kennedy Airport, thus missing the Manhattan market. A Chicago Serviceland franchise was located more than an hour's drive from the Loop.

- In some cases, individuals considering entering did not fully appreciate the costs involved in setting up and running a fully functional depot repair facility, let alone one that would also provide on-site support. Even still, potential franchisees shied away from the initial costs (e.g., up-front fees). Serviceland never approached even a third of the 100 service locations that they predicted they would have.

- During the forecast period, this trend of increased manufacturer participation in micro service will reverse itself, due to two major unseen occurrences:

  - IBM limited entrance into the micro TPM market in 1986. In May, IBM announced that it would remove or disconnect a non-IBM machine and/or feature and replace it with a similar non-IBM machine and/or feature. In June, IBM furthered its TPM involvement by announcing on-site and depot prices for the servicing of 13 different manufacturers of PC-compatible peripherals and other add-ons. Previously, IBM viewed its service as a major sales feature, and it was unlikely that IBM would ever allow its service to help the sales of others' products. While IBM's entrance into the TPM market is limited currently to products commonly present at business PC users' systems anyway, one cannot underestimate the service impact of this development.

  - The explosion in the inexpensive "clone" business, which started late in 1985 but by 1986 had made enough of an impact to cause concern over IBM's continued involvement in the low-end micro business. When even business users opted for these foreign-made PC- and XT- "workalikes" (e.g., Leading Edge and PC Limited), the fact that these products had no support opened a new market up to TPMs. Furthermore, these clones not only impacted IBM sales, but to a greater extent displaced sales of other large manufacturers of PC-compatible micros (e.g., Tandy, AT&T, Texas Instruments) with extensive manufacturer support offerings.

- The "clones" issue raises an interesting question--who is going to support these low-priced machines. Even though most of the parts are readily attainable, the already large number of different brands will make it difficult to target a sufficiently dense service base to profitably provide service. Currently, support is being left to the retailers and the users. As more business users choose these lower-priced alternatives, the question remains whether TPMs will, or even should, attempt to go after this market.

- By 1991, INPUT expects that TPMs will capture 47% of the business micro market, as shown in Exhibit V-6. The exhibit also shows the expected increase in activity that TPMs will demonstrate in the telecommunications market, particularly as TPMs gain experience with that technology.

C. CURRENT LARGE SYSTEMS SERVICE MARKET AND FORECAST, 1986-1991

- As shown in Exhibit V-7, the large systems segment (manufacturers' portion) of the overall customer services market is currently $4.1 billion, which represented a 7% growth over 1985 user expenditures. Even though product sales have been slowed by a number of factors (detailed previously), service growth was buoyed by increased user reliance on older systems along with improved efficiencies in service delivery (e.g., increased use of remote diagnostics, increased automation of logistics management, etc.). In addition, large systems service vendors continued to be successful in unbundling and selling premium support services, particularly in the education and professional service (e.g., consulting) areas.

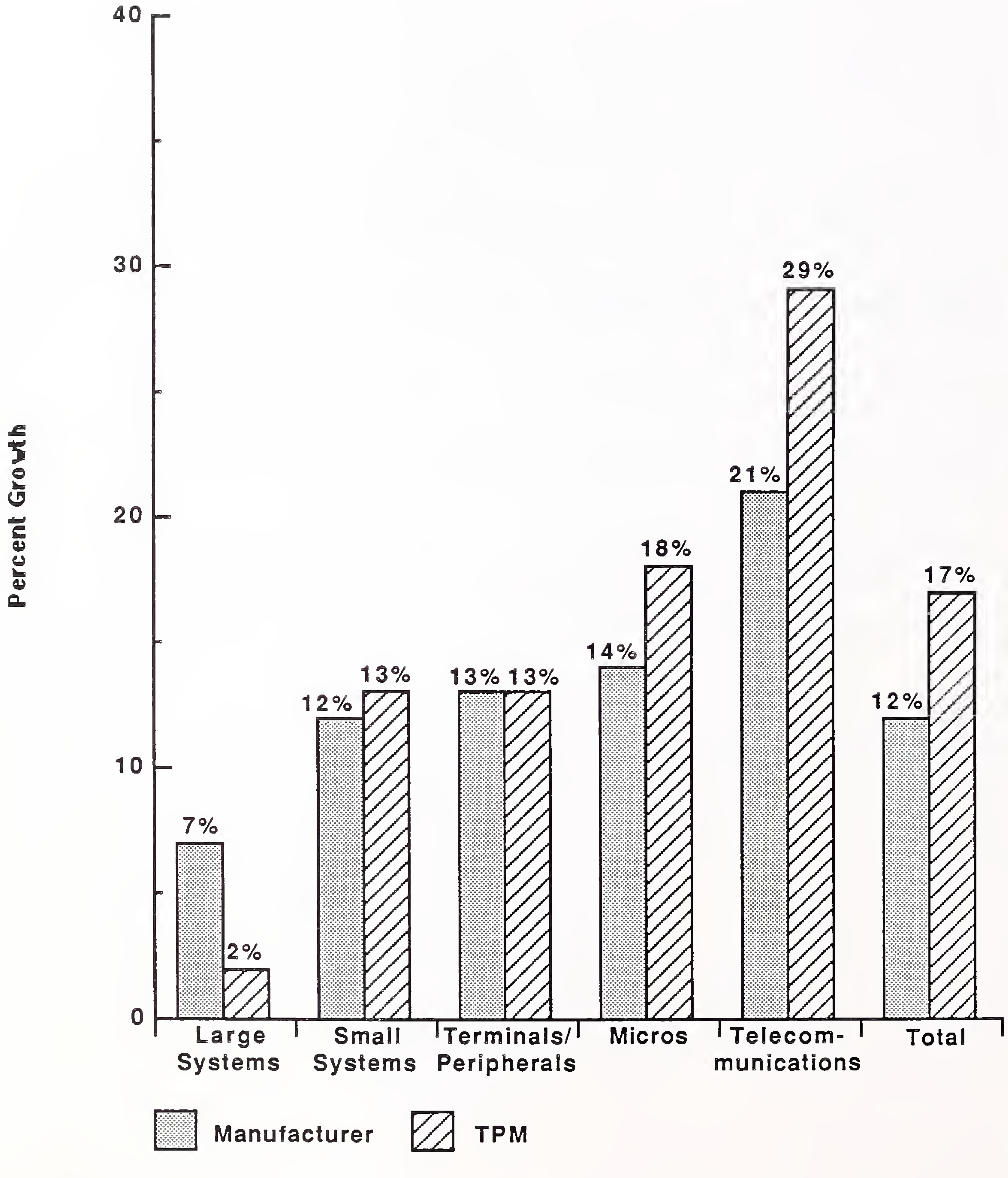
EXHIBIT V-6

TPM PENETRATION, 1991

PRODUCT SECTOR	$ MILLIONS		TPM MARKET PENETRATION (Percent)
	1991 TOTAL	1991 TPM USER EXPENDITURES	
Large Systems	$5,997	$197	3%
Small Systems	$5,025	$425	8%
Microcomputers	$2,272	$1,065	47%
Telecommunications	$3,072	$620	20%
Terminals/Peripherals	$8,047	$820	10%
Other	$1,500	N/A	-

EXHIBIT V-7

U.S. SERVICE GROWTH, 1986-1991



- The large systems segment also has benefited (price-wise) from limited competition as IBM holds over 60% of the domestic mainframe market. Since large system users are least likely to consider TPM for a number of reasons, including the availability of premium services (e.g., systems software support, consulting, training), limited price sensitivity, and greater concern over parts availability, competition in this product area is limited primarily to the manufacturers.

- In 1986, two players in the mainframe market were successful in releasing significant product alternatives to IBM mainframes. Amdahl began shipping its powerful 5890-300 processor, which is designed to compete with IBM's 3090 Model 200 both on a price and performance basis. And National Advanced Systems announced its Hitachi-made alternative, the XL Vector series. Both companies have done well recently in making inroads into the high end of the mainframe market, and both should reflect continued growth in 1987. While both companies allowed IBM a substantial headstart in the high-end mainframe market, both have presented products that significantly outperform the comparable Sierra machine at 20% less. Furthermore, both companies have weathered attempts by IBM to slow their momentum in 1986 through significant mainframe price cuts.

- However, both companies have to recognize that IBM will sit still for only so long before introducing the next family of high-end mainframes (code named Summit) at an improved price/performance ratio. IBM has the advantage of being number one in the market (actually, the number one competitor in all service markets). IBM strengths include better cost structure, better service profitability, and a larger customer base to spread service costs over. As a result, participants in this (and all other markets) face the prospects of severe competition and pressure on productivity, prices, and, inevitably, margins in service.

- An additional concern facing these two vendors should be their relationships with Hitachi (NAS) and Fujitsu (Amdahl) in light of the rising yen-to-dollar exchange. Also, Fujitsu is still required to pay IBM monthly royalties (that reportedly amount to $3-6 million a month) for use of IBM's operating system, a royalty that Hitachi only recently (November 1986) renegotiated with IBM. Some have questioned Japanese companies intentions in the plug-compatible market, predicting that the companies may either pull from the market and reenter in other more competitive markets (such as the Sperry-Hitachi deal to produce small- to medium-sized mainframes to replace the 1100 series). Others predict that these companies are biding their time, waiting for the opportunity to make a significant entrance into the U.S. market with their own product and support.

- While NAS has stressed its price/performance ratio, along with the potential for increased networking capabilities, Amdahl has emphasized support (currently, all Amdahl users receive around-the-clock maintenance coverage as basic coverage. In addition, Amdahl has a well publicized philosophy that "any problem is an Amdahl problem").

- Other mainframe manufacturers have shown minimal growth (e.g., CDC, who remains content to sell to scientific and engineering markets), and others appear to be pulling away from the market (Honeywell, who recently sold its computer systems operations to NEC Corporation of Japan and Compagnie des Machines Bull of France to form a international consortium that marked the first joint U.S./Japanese/French effort in the computer industry), but one non-plug-compatible competitor appears to have gained market share without making a significant product announcement. That company is the newly-formed Unisys, the merged efforts of Burroughs and Sperry. Prior to the merger, Burroughs and Sperry held 11% and 7% of the mainframe market respectively.

- The $4.8 billion merger culminated what at times was a hostile takeover attempt of Sperry by Burroughs. And while the resulting $10.7 billion company (with 138,000 total employees) did create a competitor second only in size to IBM (leapfrogging over DEC), the prospects of success are still in doubt. First of all, recent history of such mergers illustrates the difficulties of merging differing, formerly competitive organizations (the failed Sperry/RCA and Honeywell/GE mergers are prime examples). While every effort has been (publicly) made to demonstrate the cooperative nature of the combined company, including the new name Unisys (that resulted from a company employee suggestion, reflecting "united, information, and systems"; the company motto is "the power of 2"), upper management has had to address Sperry employee concern over job security and company direction. The company has already announced an 8% reduction in workforce (through early retirement incentives, hiring freezes, and layoffs) to address the inevitable question about functional redundancy within the combined company, although the company was quick to add that all parts of Unisys are subject. It still appears to be a Burroughs-led company, as reflected by the (tentative) customer services organization, which is led by Burroughs employees (the highest ranked Sperry employees are VPs in charge of education and professional services).

- Sperry users also are concerned about their future, particularly mainframe users who have made major investments in Sperry hardware and software. Top Burroughs executives, including Chairman W. Michael Blumenthal, have made visits to key Sperry user sites (such as the Pentagon and other federal accounts) to give assurances that Unisys will remain committed to them. However, it is questionable that Unisys will be able to continue to afford to provide support and future development on the two incompatible product lines at a time when industry pressure for complete product compatibility is rapidly increasing for all vendors, including IBM. Furthermore, it is extremely doubtful that Unisys will be able to react quickly enough in a rapidly changing marketplace carrying two separate lines.

D. LARGE SYSTEMS SERVICE REVENUE SOURCES, 1986-1991

- As previously noted, the large systems service market is currently tied with the peripherals market as the largest U.S. service market with $4.1 billion in 1986. A number of factors have slowed growth in this market (e.g., increased competition, reduced prices, and alternative DP solutions, to name a few). More importantly, a number of significant internal changes have and are continuing to occur, changes that are affecting the revenue makeup of large systems service.

- In part, these changes reflect the service vendors' recognition of increased user demand for more service and support (beyond simply "fixing" the hardware) while providing these services more efficiently and profitably. Manufacturers have been able to rely on technological advances (remote support, multiprocessor and fault-tolerant design, and improved dispatching/parts inventory systems) to a certain extent; however, the blend of services delivered has also changed, and continues to change, as vendors strive to meet the challenges of the future.

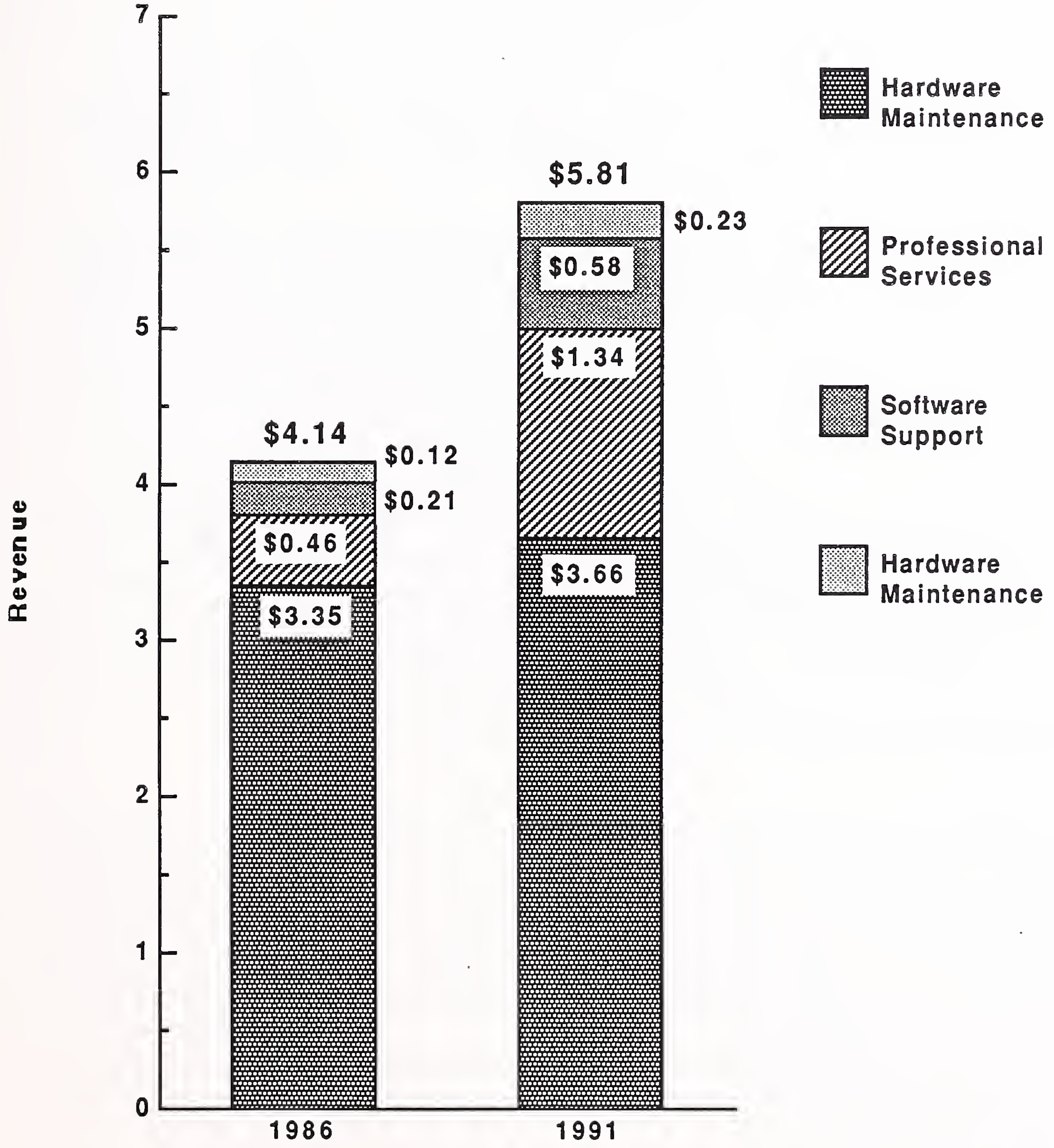
1. HARDWARE MAINTENANCE

- The most apparent change is the decreasing importance of hardware maintenance activities, both as a source of revenues and as a means of increasing system availability. Of course, hardware maintenance activities make up the lion's share of service revenues (and will continue to do so), as shown in Exhibit V-8. In fact, hardware maintenance activities comprise 81% of all service revenues in 1986. However, this percentage has been decreasing steadily (dropping from 83% in 1985) and is expected to continue to fall to 63% in 1991.

- A number of factors are contributing to the decline in the dominance of hardware maintenance as a revenue source:

EXHIBIT V-8

LARGE SYSTEMS SERVICE REVENUE
1986-1991



- Increasing demands for 100% system availability, which has required manufacturers to incorporate remote diagnostic/repair capabilities and system redundancy into new products. This recognizes the futility of relying on faster response and repair time during on-site problem calls (shown graphically in Exhibit V-9). On the other hand, users recognizing the reduced need for labor (cost)-intensive on-site visits, apply pressure for lower hardware maintenance prices.

- Other hardware design changes, particularly increased reliance on modular designs that require simple component or board swaps. Again, users recognize the cost savings resulting in this form of maintenance.

- Price drops resulting from other competitve factors, particularly as the large systems market becomes even more competitive. Service organizations are under constant pressure to reduce service prices, not only from the users but also from the service organization's own sales organization.

- Increasing demands for other support areas, particularly software support and consulting services. This has been beneficial since it moves the service organization into more profitable, less price-sensitive areas.

2. SOFTWARE SUPPORT

- An area of rapid growth potential is systems software support. Exhibit V-8 shows that systems software support contribution will grow from $500 million, or 12% of total service, in 1986 to $1.34 billion, or 23% of total large systems service, in 1991. This represents a 22% average annual growth rate (AAGR) over the forecast period, which far exceeds the overall large systems growth rate of 7%. During the forecast period, systems software support is expected to add an additional $880 million in service revenues, as shown in Exhibit V-10.

EXHIBIT V-9

SYSTEM AVAILABILITY VERSUS REDUNDANT HARDWARE VERSUS RESPONSE TIME

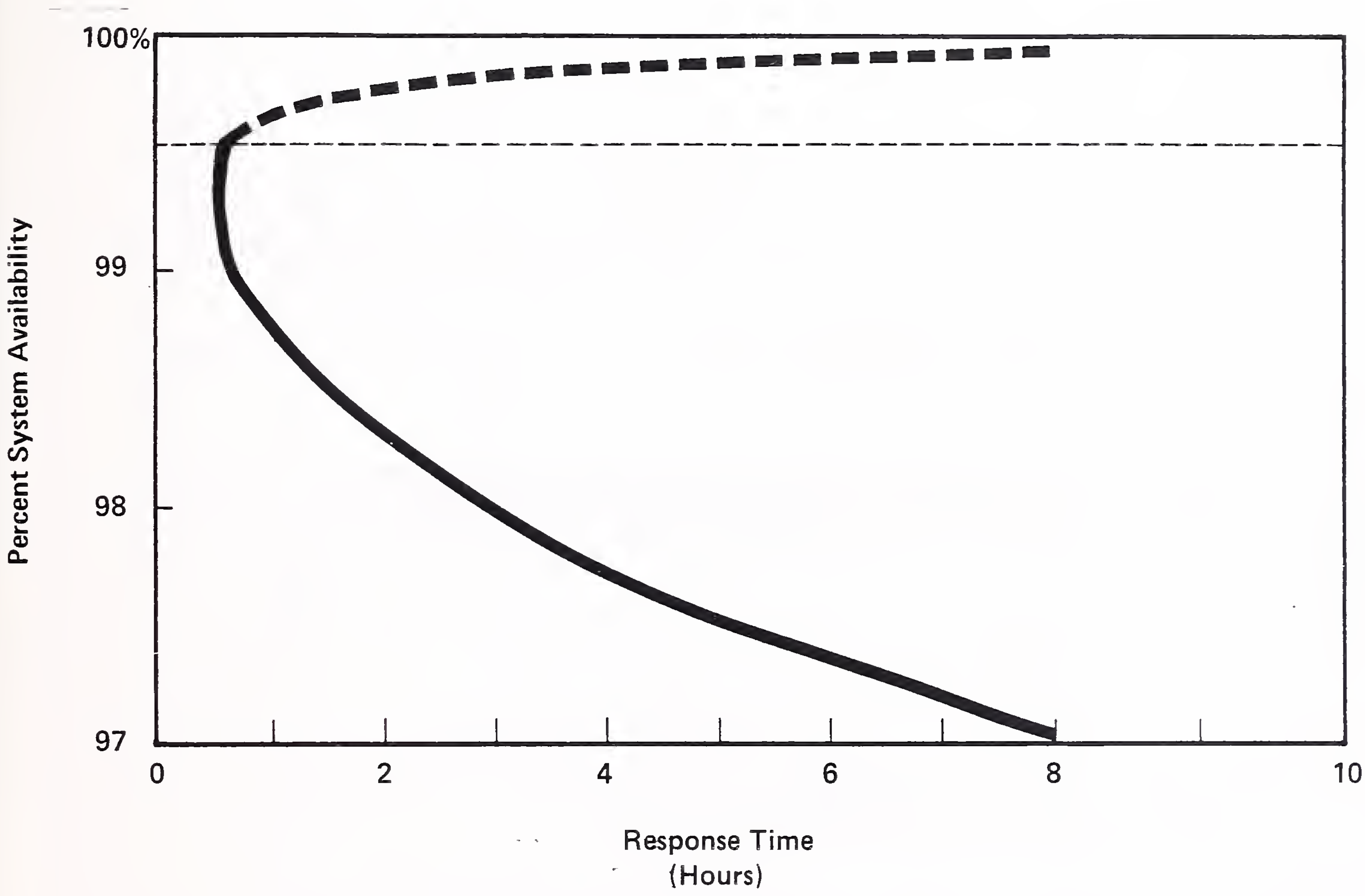
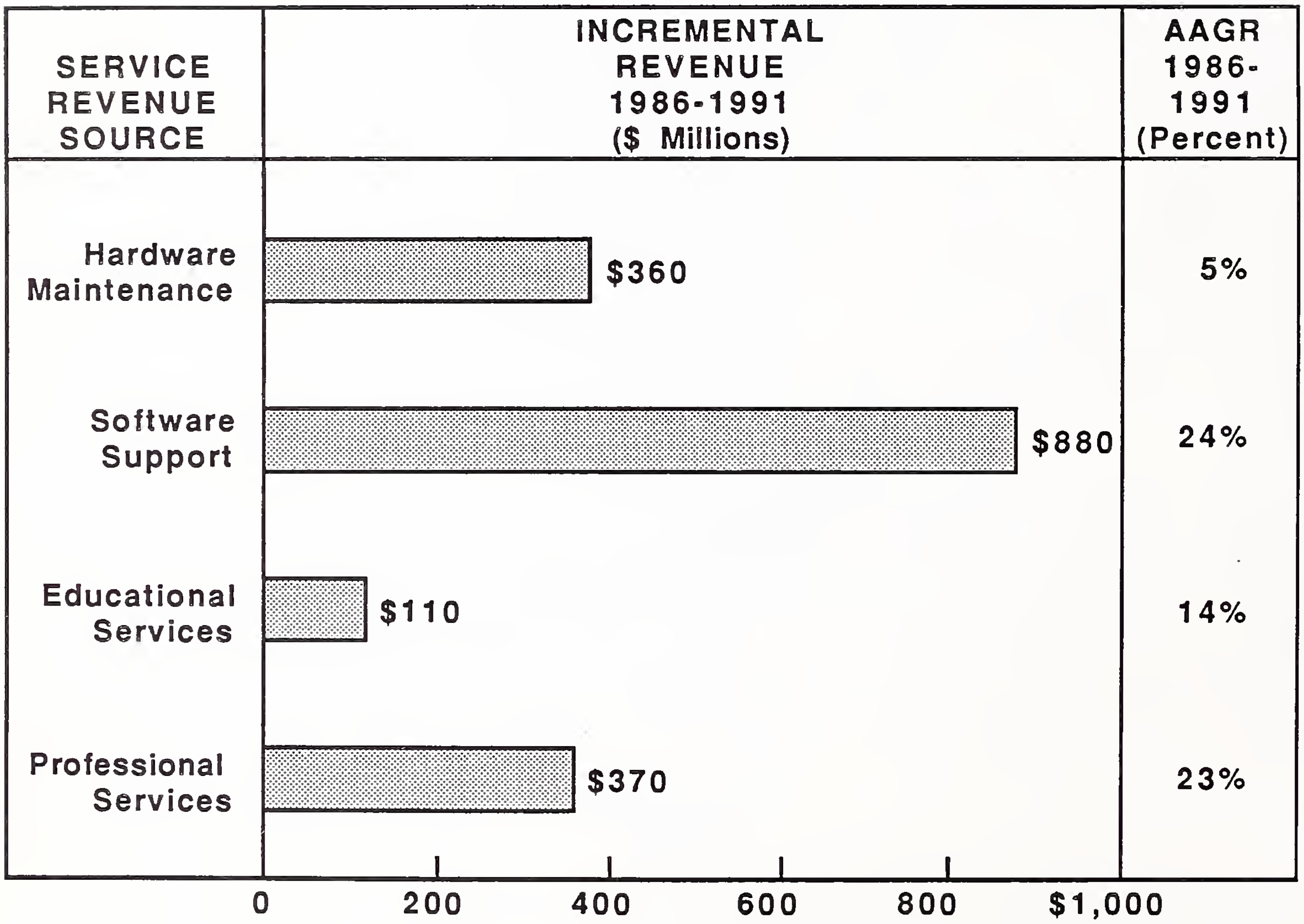


EXHIBIT V-10

LARGE SYSTEMS SERVICE GROWTH BY REVENUE SOURCE 1986-1991



- Although continuing user demand for increased and improved systems software support will contribute to this growth potential, service vendors have already actively taken steps to put in place the mechanisms to meet the needs of their users. Unfortunately, INPUT's research has found that user requirement levels are increasing at a faster rate than the manufacturers have been able to provide.

- Requirements for software support, both systems and applications, have increased dramatically for a number of reasons:

    - Users are becoming involved with increasingly complicated applications, both as a result of advancements in the software programs themselves (e.g., micro-host applications, departmental applications) and as a result of users pushing the limits of their older systems while waiting to upgrade.

    - Users are often forced to compete for a limited number of programmers, thus requiring more training and vendor support (one systems software vendor noted that a significant number of their users' average experience level has halved).

    - Users are handling an ever-increasing amount of data, and with the increased use and integration of telecommunications, this increased demand with become more pronounced.

- In 1986, INPUT surveyed 210 mainframe users concerning their requirements for all aspects of service, including software support. Although actual levels of support reported by users stayed about the same as last year's, overall satisfaction rates slumped considerably. Users reported greatest concern over documentation (a traditional problem in the eyes of the users) and software engineer skill level.

- It should be emphasized that this dissatisfaction also points out opportunities for those vendors who can identify priority service needs and address them with the user base. Prior INPUT studies indicate that large system users are less price sensitive cocerning software support. In fact, users are often willing to pay significant premiums (ranging from 13-17%) for increased and improved systems software support. It is important to make sure that these support services are readily apparent to the users, since it is as important to satisfy the users' perception of service as it is to actually perform the service (which helps explain users' lack of enthusiasm for remote software support). Thus, high visibility services such as telephone (hotline) support, training, and access to problems data bases all have dramatic effects on user satisfaction. These high visibility services, coupled with effective remote support (which reduces the costs associated with problem resolution), will increase user satisfaction and provide an increased stream of revenues for the life of the product.

3. PROFESSIONAL SERVICES

- Professional services, performed both pre- and post-sale, are growing at a rate that almost matches software support. These services typically include such pre-sale vendor service activities as environmental planning, site planning, and installation planning and such post-sale activities as consulting, network planning, and site management. In most instances, pre-sale professional services are provided free of charge to the user; however, most of the post-sale professional services have been successfully unbundled and priced accordingly. In any case, all professional services, whether performed at no cost prior to (or during) installation or performed for a fee after installation, have a significant effect on user satisfaction, not only with service, but also with the product itself.

- INPUT feels that professional service growth is assured during the forecast period due to the increased use and reliance on multi-vendor systems and multi-product systems, especially those incorporating increasing amounts of telecommunications products. As user demand for consulting services increases, user price sensitivity will decrease, allowing vendors to improve service margins in this area. A further benefit is that increased activity in this area will allow manufacturers an improved opportunity to differentiate their service offerings from those of TPMs who may offer lower prices but only deal with hardware maintenance.

4. EDUCATIONAL SERVICES

- While educational services appear to be only a minor market in terms of revenue contribution ($120 million in 1986), this area makes a vital contribution to overall user satisfaction, along with reducing the need (therefore the costs) for service. Furthermore, user requirements for additional education and training services have grown steadily in the past decade in both the hardware and software areas. As a result, INPUT believes that educational service growth during the forecast period will be 14%, increasing the contribution to service revenues to $230 million in 1991.

- The growth in educational services has been aided by the degree of service offering "unbundling" that large systems vendors have adopted. In the past, the majority of end-user training was provided free of charge, usually during and immediately following installation. Increased user demand for continuing educational services, along with a vendor recognition of the need to hold the line on basic hardware maintenance prices, encouraged vendors to separate many traditionally "free" services, such as post-installation training, and charge for them separately. Currently, most large systems vendors offer catalogs of individually priced training courses that cover a wide range of topic areas from hardware preventive maintenance to software use and optimization.

- Educational services have always been profitable, due in part to the fact that user price sensitivity in this area has traditionally been low. INPUT feels that educational services will become increasingly profitable as vendors replace traditional training methodologies such as live instruction with newer, more cost-efficient techniques like video- and computer-based training.

- While traditional live (classroom) instruction is highly desirable to users, due to a great extent to the "human element," the costs involved with supporting a large user base can be quite high. Vendors have already adopted video-based methodologies with mixed success (users complain about the rigidity of video course structure, along with the unspoken concern about the lack of human contact). In addition, video-based training programs are expensive to update.

- Computer-based training (CBT) and the related computer-aided instruction (CAI) have been used to a limited extent due to the initial high costs in program development. CBT usage will increase dramatically for a number of reasons:

    - CBT allows student-paced instruction at the user's own terminal/workstation.

    - CBT is easily adaptable and can be inexpensively updated on a periodic basis.

    - CBT program development costs are falling from the present $100,000 per hour.

- As the technology becomes more available and affordable, INPUT feels that CBT/CAI educational services will be supplemented or even supplanted by computer-generated custom interactive videodisk techniques. Videodisks can provide vast sums of data with fast access capabilities. In addition, videodisk technology can incorporate visual images (not just computer generated graphics), which lends itself well for instructional purposes.

E. CONCLUSIONS AND STRATEGIC RECOMMENDATIONS

- In the following chapter, INPUT will address key large systems market issues and their effect on service delivery over the next five years. In addition, a series of strategic service objectives and recommendations will conclude this report.

- The large systems market is currently undergoing period significant changes. The second and fourth largest mainframe manufacturers (Burroughs and Sperry) combined forces, the third largest manufacturer (Honeywell) phased out its presence in the market, and the hottest battleground exists at the high end where IBM squares off against the two leading plug-compatible (PCMs) vendors, NAS and Amdahl.

- The products themselves are evolving toward multiprocessor and vector processor (previously used primarily in scientific and engineering applications, but now being applied in business applications that need fast number-crunching capabilities). Exhibit V-11 summarizes large systems market changes.

- Service has been affected, both by changes within the marketplace and by the changing product design. While it is too early to predict the prospects of the newly formed Unisys capturing a larger segment of the mainframe market, the only companies that have been successful in making inroads into the mainframe market have been the two PCMs, NAS and Amdahl, both on the basis of their new products (which happen to be both multiprocessor and vector processor machines). While IBM will surely recapture the market with the release of its next generation of machines (the Summit family), the question remains whether the market will become even more populated by IBM and compatible machines.

EXHIBIT V-11

LARGE SYSTEMS MARKET ISSUES

- Market Will Be Increasingly Dominated by IBM and Plug-Compatibles
- Machines Will Be Multiprocessor and Vector-Processor
- Increased Use of Remote Diagnostics and Fixes
- Low End Faces Increased Competition from Networked Superminis
- Emphasis on Peripheral Reliability

- Obviously, one of the major sales features of multiprocessor systems is the improved system availability that these machines offer. As users become more demanding of 100% system availability, vendors will need to incorporate fault-tolerant design and remote support capabilities in all of their systems, including the peripheral devices. Thus, the next emphasis should be placed on increasing the system availability of peripherals.

- Traditional large systems manufacturers will also have to be aware of competition from below as fast growing superminicomputer vendors release increasing powerful systems with extensive networking capabilities. In the past, mainframe vendors had been able to stress the differences in support and service, as well as the systems processing capabilities. Now, the superminicomputer systems are becoming increasingly powerful and, at the same time, support and service levels are approaching those of traditional mainframes.

- Perhaps most important, large systems manufacturers must address the need to provide more service (as shown in Exhibit V-12), while reducing service costs in order to maintain stable basic service prices. To do so, vendors should continue to unbundle traditional hardware maintenance activities while bundling other premium services (to be further discussed later in this chapter).

- Another issue that large systems vendors need to address is the rapidly growing need for increased and improved software support. The manufacturer has almost complete responsibility for the operating system, yet often prefers to concentrate on the hardware and leave the software to the end user. Yet only 43% of the large systems user sample were satisfied with their systems software support. As hardware becomes increasingly reliable, user requirements for software reliability will become accentuated. Hardware will become a "given"; users will decide on systems based on software performance and support capabilities.

- Vendors have already begun unbundling service offerings, which has resulted in more extensive service "menus" and has allowed users to pick the level and

EXHIBIT V-12

LARGE SYSTEMS SERVICE ISSUES

- Hardware Reliability Becoming Standard Due to Redundancy
- Increased Demand on Software Support
- Unbundling of Hardware Maintenance Activities
- Bundling of Premium Support Offerings

amount of service that they require at price levels that they deem reasonable. IBM was one of the first large systems vendors to successfully target users with varying levels of service, particularly in the area of professioal services. As a result, IBM successfully satisfies a high percentage of its users, even though its particular service offering might not necessarily exceed that of its competitors. Instead, IBM excells at identifying and addressing the priority services needed by the majority of its users without exceeding the level needed. Other vendors have been less willing to unbundle their service offerings, preferring to provide the perception of being a "full service provider."

- In the long run, vendors will need to address user pressure to reduce prices, particularly as users recognize that hardware maintenance costs (to the vendor) are declining as hardware reliability increases. To successfully accomplish this, all large systems service vendors will have to provide low cost "basic services," while providing separately priced premium levels of service to satisfy high-requirement users. Thus, large systems vendors will need to continue to unbundle their service offerings.

- Another advantage of unbundled service offerings is that each standalone service can be priced, marketed, and sold individually, which makes it possible to price competitively while making sure that each service is profitable. Since user price sensitivity is increasing in hardware maintenance while remaining less so in software support, educational services, and professional service areas, the service vendor will be less pressured to lower prices for what essentially will be the same services.

- One creative way of marketing premium service offerings is to unbundle basic hardware activities from the non-hardware areas and to repackage, or rebundle, popular premium services together. For example, users are more apt to choose reduced service levels if they can receive additional training and consulting services for an appropriate premium.

- An ideal application of this concept is in the area of software support, where users' requirements for service are quite high but the initial costs of providing more service makes it difficult to address this problem area. One repackaging solution would be to sell a combined package of telephone support that includes on-line access to a problems data base. Both of these services are highly visible to the end user while at the same time cost the vendor much less than on-site support.

- Vendors have traditionally tried to address user price sensitivity in two manners--through extensive (almost arbitrary) discounting of services and through the encouragement of user involvement in the maintenance process.

- Discounts are usually negotiated at the time of contract negotiation, usually in hope of finalizing the deal. Typically, service discounts are based on multi-system installations at a single site and are usually based on a specified dollar volume. Discounts are also given to users who prepay their service contract as a reward for reducing the costs involved in billing.

- The amount of discounting often reflects both the competitiveness of a market and, in many cases, the "softness" of a market. Currently, competition in the service market has encouraged most vendors to consider offering larger discounts as a sales inducement. Even IBM has been forced to incorporate service discounts, first with the Enterprise Maintenance Agreement of 1985, and then with the Corporate Service Ammendment of 1986.

- The Enterprise Maintenance Agreement (EMA), also referred to as the Corporate Enterprise Maintenance Agreement, was a test program designed to provide large, multi-data center corporations a substantial service discount (that may have ranged from 12-14%) if the user brought all (or in some cases, at least 90% of all equipment at all sites) of their IBM equipment under the contract. The user also had to agree to perform a specified level of diagnosis prior to calling their service representative. Many in the industry saw this as an effort to retrieve service business back from TPMs, particularly terminal and peripheral business. Users became confused about the level of non-IBM service allowed and the level of discount expected, and IBM quietly ended the test program.

- In October 1986, IBM announced a new service discount policy called the Corporate Service Amendment. Again targeted at large corporate users, the program offers discounts to users who "demonstrate effective systems management control procedures, as defined by IBM." The policy allows discounts for both data processing and network systems management. Users must prepay an "initialization" fee (for a qualifying inspection) of $3,500 per location or $8,600 per network control center. Customers also have to agree to the following:

    - Periodic on-site assessments of systems management procedures.

    - Customer assurance that specified operational and problem logs must be kept, along with a complete log of all diagnostic steps taken.

    - Customer assurance that all Customer Problem Analysis and Resolution (CPAR) procedures have been taken prior to calling IBM.

- For this increased user involvement in support, the user can expect a service discount that ranges between a low of 4% for a one-year contract (or 14% for a three-year contract) to a high of 20% for a one-year contract (or 30% for a three-year contract). With the schedules of discounts, IBM lists per-machine termination charges that vary by machine type anywhere up to $12,500 per year.

- While it is too early for an extensive analysis of the market impact of this offering, it does highlight the growing competitiveness of the service market. While some within the TPM industry have doubted the seriousness of the offering's impact on their service base since TPM service usually is priced at a 20-25% discount of IBM's service price anyway, this offering will surely sway price sensitive IBM contract holders who were at least considering switching to TPM.

- The inherent danger in discounting service is that it reduces the perceived value of the service offering, thus contributing to the price sensitivity of the user. Instead, vendors need to raise the user's perception of the service offerings value.

- Other large systems vendors have used various discount inducements to increase service coverage. Amdahl, for example, uses discounting as a sales inducement for their extended service contract. Thus, Amdahl does not decrease the value of their basic service coverage; rather, they increase the acceptance and reliance on more expensive premium service offerings.

- As suggested with the IBM CSA agreement, vendors view increased user participation in the maintenance process as a crucial way to increase the support available to users while reducing the costs to the vendor. Encouraging such user "self-maintenance" is a two-edged sword:

    - Increasing user involvement in service does reduce costs, particularly when the user is responsible for screening trouble calls, performing rudimentary diagnostics, picking up or collecting dispersed products (such as terminals and micros), and performing selected board swaps and component exchanges. Another benefit is that as users become more involved in service, they recognize the value of service.

    - On the other hand, increasing user involvement in service, along with the discounts that users expect for their involvement, inevitably reduces the amount of service revenue potential, leaving important service dollars "on the table." Furthermore, it increases user service price sensitivity, as users recognize how much time and effort is required to perform such duties, causing users to demand greater and greater discounts.

- INPUT's user service requirements research indicates that large systems users are willing to perform first level diagnostics on their systems. Users also report a desire to become more involved in software support, in part a result of their dissatisfaction with their current level of support. In both cases, users will need improvements in documentation quality. Also, a significant portion of these users requested additional telephone support. Exhibit V-13 summarizes these points.

- One last key issue in large systems service delivery is the increased reliance on remote support services (RSS). Initially, remote support was delivered in the form of diagnostics performed from a remote vendor location, usually a standalone central support location. Early user reaction was mixed--users recognized the potential for faster service but were hesitant to commit to RSS for three reasons:

  - Users were concerned about data security, even in situations where the vendor would have to receive permission to run diagnostics. Users were concerned even when the vendor ran diagnostics that stopped at the controller level.

  - Users were confused by early RSS policies, which were very inconsistent with regard to pricing of RSS and responsiblity for necessary equipment. For example, some vendors required users to purchase a specific modem to run diagnostics, while others supplied one for free. In a sense (and in the eyes of the user), some vendors charged a premium for RSS, and others provided RSS either as a free service or at a discount. Users recognized that vendors were a primary beneficiary of RSS (a typical user comment: "The vendor is trying to cut costs and charge me more at the same time").

  - Users were concerned that they would lose personal contact with the service vendor as RSS would make on-site visits obsolete. This less

EXHIBIT V-13

SELF-MAINTENANCE TRENDS

- Users Most Willing to Diagnose Problems, Particularly in Conjunction with Phone Support
- User Dissatisfaction with Software Support Increases Willingness to Participate in Self-Support
- Users Still Wary of Installing Hardware Modules, Even with Phone Support
- User Dissatisfaction with Documentation Limits User Willingness to Increase Self-Maintenance

tangible concern was nevertheless the most difficult concern to overcome, since it dealt with perceptions (the "warm fuzzies" so often associated with service).

- Presently, RSS services are overcoming user resistence as the benefits of RSS become increasingly clear to the user. Furthermore, advanced products incorporate remote problem resolution capabilities, both on the software and hardware side. It is obvious that RSS is vital in the pursuit of 100% systems availability. Exhibit V-14 summarizes RSS trends in large systems service.

EXHIBIT V-14

REMOTE SUPPORT TRENDS

- User Requirements for 100% System Availability Increases User Recognition of Remote Support Value
- User Satisfaction with Remote Support Is Still Low (43% Satisfied)
- Concern Expressed about Pricing Policies
- Slowly Overcoming Need for On-Site "Hand-Holding"

VI APPENDIX

- The following section contains additional information sent at various times throughout the year to supplement the research findings for this module. Examples of such additional information includes sample questionnaires, definition lists, and industry summary exhibits.

APPENDIX VI-A: QUESTIONNAIRE

1. CPU manufacturer ____________________

2. CPU model ____________________

3a. What percent uptime do you require? (e.g. 99.9) ____________

3b. What percent uptime are you currently receiving? (e.g. 99.9)

____

4a. How many system interruptions do you have each month? (e.g. 0.5)

____

4b. What percent are hardware-related? (e.g. 75.0) ____________

4c. What percent are software-related? (e.g. 25.0) ____________

HARDWARE SUPPORT

5a. What is your requirement for hardware response time (CPU on-site)? (e.g. 1.0 hours)

____

5b. What do you currently receive? (e.g. 1.0 hours) ____________

6a. What is your requirement for hardware repair time? (e.g. 1.0 hours)

____

6b. What do you currently receive? (e.g. 1.0 hours) ____________

7a. Please rate, on a scale of 1-10, your requirements for the following hardware goods and services.

7b. Please rate your current level of satisfaction with the services you receive from your hardware maintenance vendor.

	a. (Require)	b. (Current)
1. Hardware documentation		
2. Hardware training		
3. Hardware consulting		
4. Hardware remote support		
5. Hardware engineer skill level		
6. Parts availability		
7. Hardware Service Overall		

SOFTWARE SUPPORT

8a. What is your requirement for systems software response time? (e.g. 1.0 hours)

____

8b. What do you currently receive? (e.g. 1.0 hours) ____________________

9a. What is your requirement for systems software fix? (e.g. 1.0 hours)

____

9b. What do you currently receive? (e.g. 1.0 hours) ____________________

10a. Please rate on a scale of 1-10 your requirement for the following systems software goods and services.

10b. Please rate on a scale of 1-10 your current level of satisfaction with the systems software goods and services you received.

	a. (Require)	b. (Current)
1. Software documentation	________	________
2. Software training	________	________
3. Software consulting	________	________
4. Software remote support	________	________
5. Software engineer skill level	________	________
6. Software Support Overall	________	________

OTHER SUPPORT

11. Do you currently use third-party maintenance on any of you DP equipment? (yes = 1, no = 2)

____

12. (If yes on 11) What TPM vendor are you using?

____

____

13a. What is your requirement for any of these following services?

13b. What would you consider a reasonable premium to pay for these services (over and above BMMC)? (ask part "b" only if part "a" require equals or exceeds "5")

	a. (1-10)	b. (Percent)
1. Standby coverage	______	______ %
2. Remote diagnostics	______	______ %
3. Scheduled PMs during non-prime hours	______	______ %
4. Deferred response time (discount)	______	______ %
5. Under 2 hour response time (premium)	______	______ %
6. Maintenance management	______	______ %

14. On a scale of 1-10, what is your willingness to participate in the following support activities?

	(1-10)
a. Work with a support center to diagnose problems	______
b. Install software patches or modifications	______
c. Install circuit boards or hardware modules	______
d. Deliver equipment to a depot	______

15. In which single service area would you like your vendor to improve?

____

____

____

____

____

Thank You!

APPENDIX VI-B: DEFINITIONS

- APPLICATIONS SOFTWARE - Software that performs processing to service user functions.

- BOC - Bell Operating Company.

- CONSULTING - Includes analysis of user requirements and the development of a specific action plan to meet user service and support needs.

- DISPATCHING - The process of allocating service resources to solve a support-related problem.

- DIVESTITURE - The action, stemming from antitrust lawsuits by the Department of Justice, which led to the break-up of AT&T and its previously owned local operating companies.

- DOCUMENTATION - All manuals, newsletters, and text designed to serve as reference material for the ongoing operation or repair of hardware or software.

- END USER - May buy a system from the hardware supplier(s) and do own programming, interfacing, and installation. Alternatively, may buy a turnkey system from a systems house or hardware integrator.

- ENGINEERING CHANGE NOTICE (ECN) - Product changes to improve the product after it has been released to production.

- ENGINEERING CHANGE ORDER (ECO) - The followup to ECNs which include parts and a bill of material to effect the change in hardware.

- ESCALATION - The process of increasing the level of support when and if the field engineer cannot correct a hardware or software problem within a prescribed amount of time, usually two to four hours for hardware.

- FIBER OPTICS - A transmission medium which uses lightwaves.

- FIELD ENGINEER (FE) - For the purpose of this study, field engineer, customer engineer, serviceperson, and maintenance person were used interchangeably and refer to the individual who responds to a user's service call to repair a device or system.

- HARDWARE INTEGRATOR - Develops system interface electronics and controllers for the CPU, sensors, peripherals, and all other ancillary hardware components. May also develop control system software in addition to installing the entire system at the end-user site.

- ISDN - Integrated Services Digital Network. A proposed standard for digital networks providing transport of voice, data, and image using a standard interface and twisted pair wiring.

- LADT - Local Area Data Transport. Data communications provided by the BOCs within local access transport areas (LATA).

- LARGE SYSTEM - Refers to traditional mainframes including at the low end IBM 4300-like machines and at the high end IBM 308X-like machines. Large systems have a maximum word length of 32 bits and a standard configuration price of $350,000 and higher.

- MEAN TIME BETWEEN FAILURES (MTBF) - The elapsed time between hardware failures on a device or a system.

- MEAN TIME TO REPAIR - The elapsed time from the arrival of the field engineer on the user's site until the device is repaired and returned to the user for his utilization.

- MEAN TIME TO RESPOND - The elapsed time between the user placement of a service call and the arrival at the user's location of a field engineeer.

- MICROCOMPUTER - A microprocessor-based single- or multi-user computer system typically priced less than $15,000. A typical configuration includes an 8- or 16-bit CPU, monitor, keyboard, two floppy disk drives, and all required cards and cables.

- MINICOMPUTER - See Small System.

- OPERATING SYSTEM SOFTWARE (SYSTEMS SOFTWARE) - Software that enables the computer system to perform basic functions. Systems software, for the purposes of this report, does not include utilities or program development tools.

- PBX - Private Branch Exchange. A customer premises telephone switch.

- PERIPHERALS - Includes all input, output, and storage devices, other than main memory, which are locally connected to the main processor and are not generally included in other categories, such as terminals.

- PLANNING - Includes the development of procedures, distribution, organization, and configuration of support services. For example, capacity planning, "installation" planning.

- PLUG-COMPATIBLE MAINFRAME (PCM) - Mainframe computers that are compatible with and can execute programs on an equivalent IBM mainframe. The two major PCM vendors at this time are Amdahl and National Advanced Systems.

- PROFESSIONAL SERVICES - A category services including system design, custom programming, consulting, education, and facilities management.

- RBOC - Regional Bell Operating Company. One of seven holding companies coordinating the activities of the BOCs.

- RESELLER - A marketing organization which buys long-distance capacity for others at wholesale rates, selling services at retail but discounted prices, and profiting on the difference.

- SMALL BUSINESS COMPUTER - For the purpose of this study, a system which is built around a Central Processing Unity (CPU), has the ability to utilize at least 20M bytes of disk capacity, provides multiple CRT workstations, and offers business-oriented system software support.

- SMALL SYSTEM - Refers to traditional minicomputer and superminicomputer systems ranging from a small multi-user, 16-bit system at the low end to sophisticated 32-bit machine at the high end.

- SOFTWARE DEFINED NETWORK - A private network which uses public network facilities, and which is configurable on an as-needed basis by the user (see Virtual Private Network).

- SOFTWARE ENGINEER (SE) - The individual that responds (either on-site or via remote support) to a user's service call to repair or patch operating systems and/or applications software.

- SOFTWARE PRODUCTS - Systems and applications packages which are sold to computer users by equipment manufacturers, independent vendors, and others. Also included are fees for work performed by the vendor to implement a package at the user's site.

- SUPERMINICOMPUTER - See Small System.

- SYSTEMS INTEGRATION - The action of a single service vendor's design, development, and implementation of a system or subsystem including integration of hardware, software, and communications facilities for a customer.

- SYSTEM INTERRUPTION - Any system downtime requiring an Initial Program Lod (IPL).

- SYSTEMS HOUSE - Integrates hardware and software into a total turnkey system to satisfy the data processing requirements of the end user. May also develop system software products for license to end users.

- T-l - Refers to a standard 1.544 megabit per second digital channel used between telephone company central offices and is now used for microwave, satellite, fiber optics, or other bypass applications.

- THIRD-PARTY MAINTENANCE (TPM) - Any service provider other than the original equipment vendor.

- TRAINING - All audio, visual, and computer-based documentation, materials, and live instruction designed to educate users and support personnel in the ongoing operation or repair of hardware and software.

- TURNKEY SYSTEM - Composed of hardware and software integrated into a total system designed to completely fulfill the processing requirements of a single application.

- VSAT - Very Small Aperture Terminal. A small satellite dish system, usually using Ku-band frequencies.

- VIRTUAL PRIVATE NETWORK - A portion of a public network dedicated to a single user.